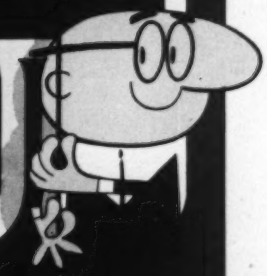
JANUARY 4, 1960

STEEL
The Metalworking Weekly

A PENTON PUBLICATION

1960

PRODUCTION EFFICIENCY



METALWORKING YEARBOOK AND PLANNING GUIDE

How to Get It

Better policies for both acquiring and using equipment can help solve many problems, particularly costs, PAGE 93

- Metalworking Outlook, PAGE 85
- Managers Look Ahead to Record Year, PAGE 97
- Experts Predict Progress in Technology, PAGE 187
- Facts and Figures for Your Planning, PAGE 137

COMPLETE CONTENTS—TURN PAGE

How B&W JOB-MATCHED TUBING helps you engineer-for-profit

You can count on B&W Tubing to help reduce costs and make a better product because from B&W you can get:

- . . . a choice of either seamless or welded types to meet your job requirements economically.
- . . . standard or special specifications to help simplify fabrication.
- . . . engineering help in your selection of the *one* tubular product best suited to your needs.

These are just a few of the reasons why it pays to specify B&W Job-Matched Tubing. Call your local B&W District Sales Specialist, or write for Bulletin TB-361 for full details. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA-9029-G5

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

This Week in STEEL

The Metalworking Weekly

January 4, 1960 Vol. 146 No. 1

▸ Metalworking Outlook, Page 85

The Editor's Views—The Competitive Sixties! 91

▸ Production Efficiency: How to Get It—Better policies for both acquiring and using equipment can help you to solve many problems in 1960 93

▸ Managers Look Ahead to Record Year—Results of STEEL survey 97

Politics: Business' Big Challenge—Soaring or sorry sixties? .. 106

Detroit Drives for Economy Decade—Seeks ways to cut costs.. 117

▸ Metalworking Facts & Figures, Page 137

This section contains 48 pages of charts and tables to help you in your planning throughout the year

▸ Forum on Technical Progress, Page 187

Comments of 278 authorities in 15 metalworking categories are presented in this section

Chronology of 1959

Launching Pad for 1960—Events of last year summarized 351

Market Outlook, Page 379

Complete Index to Market News and Prices 379

Imbalances Mar Component Stocks—STEEL's quarterly survey 381

Steelworks Operation Chart and District Ingot Rates 386

Scrapmen Optimistic for 1960—Demand expected to rise 401

Nonferrous Metals—Prospects for 1960 Bright 404

▸ Articles listed on cover.

WHERE TO FIND

Metalworking Pulse. Turn page		Mirrors of Motordom ...	117
STEEL Servicenter	5	Men of Industry	127
1960 Calendar Highlights	10	Calendar of Meetings	345
Editorial & Business Staffs	16	New Products	361
Windows of Washington .	106	Advertising Index	408

Index available semiannually.

STEEL is also indexed by Engineering Index, 29 W. 39th St., New York 18, N. Y.

STEEL, the metalworking weekly, is selectively distributed without charge to qualified management personnel with administrative, production, engineering, or purchasing functions in U. S. metalworking plants employing 20 or more. Those unable to qualify, or those wishing home delivered copies, may purchase copies at these rates: U. S. and possessions and Canada, $10 a year; all other countries, $20 a year; single copies, 50 cents. Metalworking Yearbook issue, $2. Published every Monday and copyright 1959 by The Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

Metalworking Pulse ▸

TURN

Metalworking Pulse

INDUSTRIAL PRODUCTION INDEX

	WEEK ENDED DEC. 26	PREVIOUS WEEK	MONTH AGO	YEAR AGO
(1947-49=100) Based on steel output, electric power output, freight carloadings, auto assemblies	163†	180	158	140

†Preliminary.

The Christmas holidays took their toll on each of the four components of STEEL's industrial production index, resulting in a drop from the record 180 (1947-49=100) of the previous week to a preliminary 163 for the week ended Dec. 26. However, this was the smallest decline for any comparable week since 1955.

U. S. PASSENGER CAR PRODUCTION

	WEEK ENDED JAN. 2	PREVIOUS WEEK	MONTH AGO	YEAR AGO
Number of units assembled	100,000*	102.315†	55,337	97,664

(Source: Ward's Automotive Reports.) *Estimated. †Preliminary.

As anticipated, auto producers cut back production about one-third below the preholiday level for both the Christmas and New Year's weeks. This week, full scale output will resume, and you can expect the highest rate of assembly in several years as manufacturers try to refill depleted stocks.

NATIONAL STEEL INGOT PRODUCTION

	WEEK ENDED JAN. 3	PREVIOUS WEEK	MONTH AGO	YEAR AGO
Net tons (thousands)	2,690*	2,636†	2,650	2,058
Index (1947-49=100)	167.5*	164.1†	165.0	128.1
Percentage of capacity	95.0*	93.1†	93.6	76.2

*Estimated by STEEL; comparative figures reported by AISI. †Preliminary.

The New Year opens with steelmen optimistic that production records will be set during the next 12 months. Large tonnages will be required to rebuild inventories and to sustain a high level of industrial activity.

Details on Page 386

STEEL SCRAP PRICE COMPOSITE

	DEC. 30	WEEK AGO	MONTH AGO	YEAR AGO
Based on No. 1 heavy melting grade at Pittsburgh, Chicago, and eastern Pennsylvania.	$41.33	$41.33	$42.67	$39.67

Domestic demand for scrap this year will increase about 6 million tons over the estimated 24 million tons in 1959, forecasts the Scrap Institute. Estimates of shipments, including exports, range up to 34 million tons.

Details on Page 401

FINISHED STEEL PRICE INDEX

	DEC. 29	WEEK AGO	MONTH AGO	YEAR AGO
Based on Bureau of Labor Statistics data (1947-49=100)	186.8	186.8	186.8	186.9

Terms of the pending wage contract hold the key to early 1960 price decisions. Producers have implied that a noninflationary settlement would support market stability. The last over-all price revision: August, 1958.

Details on Page 387

Look who burned his finger ...at a backyard barbecue

If a Bethlehem steelworker is injured, it happens at home more often than in the steel plant. As a matter of record, he's many times safer on the job than he is at home.

For example, in a recent 12-month period the 20,000 men normally employed at our Bethlehem, Pa., plant sustained a total of 152 disabling accidents at home or on the highways. During the same period these employees had only 19 lost-time accidents at work in the plant. In other words, exactly 8 such accidents *outside* the plant for every one that occurred while at work.

For every one of the past 17 years a Bethlehem plant has won first place in the National Safety Council's annual contest among the nation's 20 largest steel plants.

It is heartening to know that in America the advances in steel technology have been more than matched by the accomplishments in the field of human safety.

BETHLEHEM STEEL

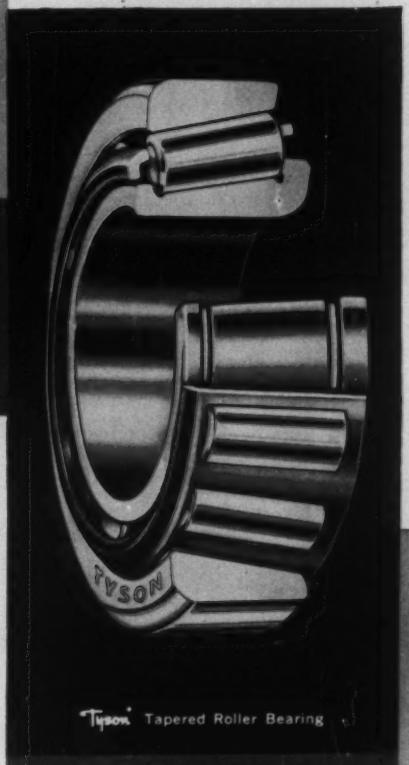
BETHLEHEM STEEL

We make so many sizes... your "specials" could be our "standards"

Angular Contact Bearing

Spherical Roller Bearing

Spherical Roller Thrust Bearing



"Tyson" Tapered Roller Bearing

Cylindrical Roller Bearing

Single-Row Deep Groove Bearing

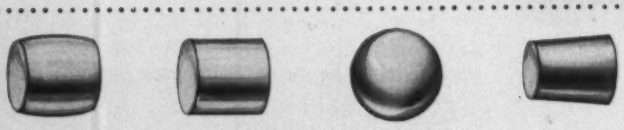
We regularly produce all of the bearings shown here in a tremendous variety of bores, outside diameters, and widths.

Take just the Tyson tapered roller bearing, for example. We make nearly 1,000 sizes of the single-row, straight bore type alone! Bore sizes range from five-eighths of an inch right up to a precise fourteen inches. And these figures don't include the many other sizes available in our double- and four-row types.

Yet they are all standard SKF *bearings,* promptly available in large quantities at competitive prices.

So, why not get full details on the most complete line in the business? Any of our twenty-five sales offices can quote you facts and figures. Just call the one near you.

5921

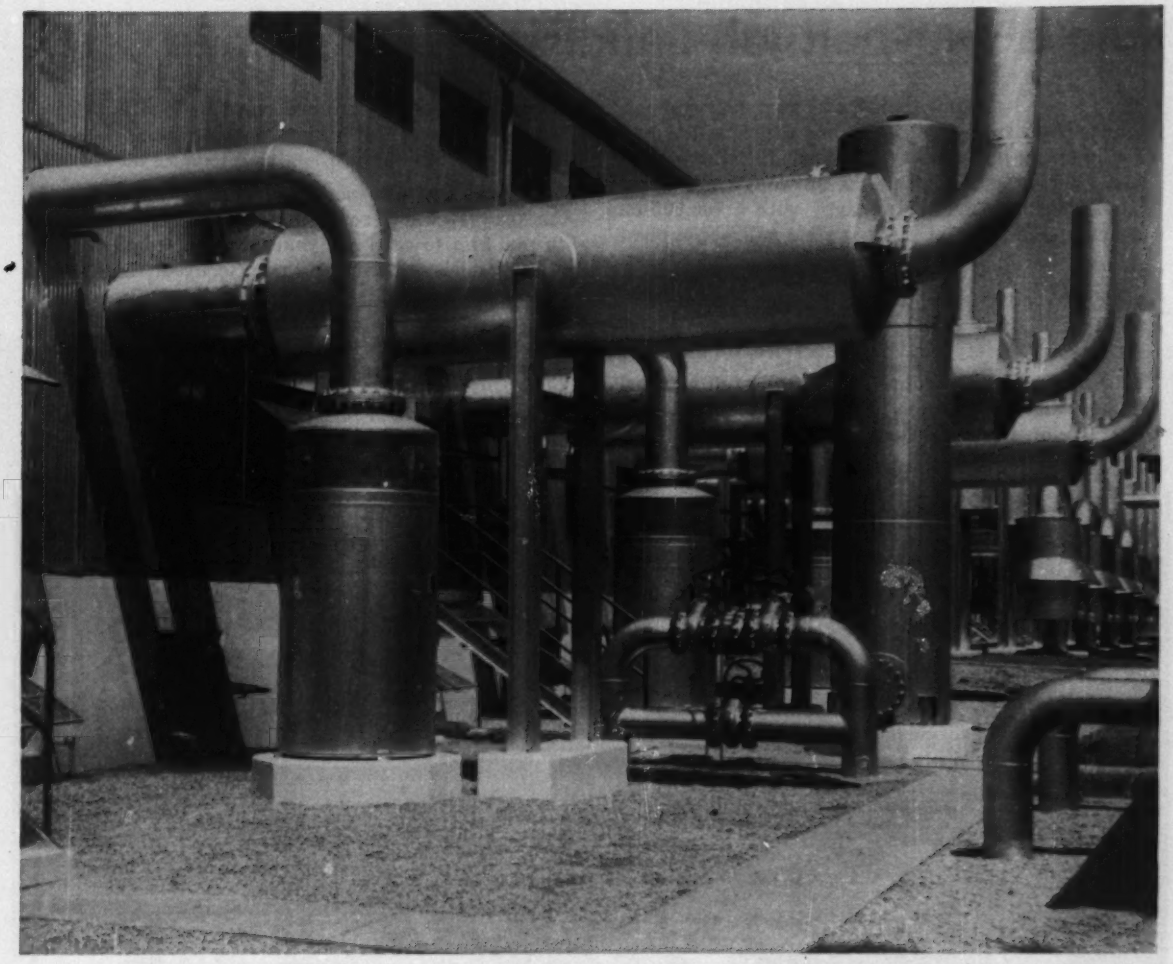

Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.



"Sound Engineering"
pays off with precision stampings

Silencing high-energy exhaust gases from powerful stationary engines calls for snubbers that can take years of explosive pressure without mechanical failure.

Burgess-Manning Snubbers handle the job with a heavy-gauge cylindrical pressure vessel type construction, continuously welded throughout. Their scientifically engineered multiple chambers prevent, rather than muffle, noise by converting exhaust "slugs" to a continuous flow.

Ends of these cylindrical vessels must meet the same exacting standards. And, Burgess-Manning relies on COMMERCIAL for the ends of their snubbers.

COMMERCIAL's complete facilities prove a dependable "one source" with dies in existence to cover Burgess-Manning's entire size range requirement. Diameters 24", 30", 36", 42", 48", 54", 60" and 72"—each in proper thickness to meet any pressure requirement.

Through its extensive "Die Bank", COMMERCIAL has made its standard metal shapes available to O.E. manufacturers for over 30 years. Drawing from over 20,000 components, dies can be assembled to form economical metal component parts having higher functional efficiency. Many unusual parts have been put up to COMMERCIAL to produce which, with slight modification to fit the "Die Bank" pattern, have resulted in customer cost benefit. Specials often require only partial tooling cost.

COMMERCIAL engineering assistance is always available to help you make the most advantageous use of this important service. Before starting your next job, write for Catalog 200-C1 which details all standard shapes and dimensions available. Address: Commercial Shearing & Stamping Company, Dept. L-2, Youngstown 1, Ohio.

Specialists in the shape of things to come
CUSTOM STAMPING • UPSET FORGING • ROTOFORMING

COMMERCIAL
shearing & stamping

Did a two-belt job handling red-hot coke

You'd look a long time to find a tougher conveyor job: tonnage is heavy—coke is highly abrasive—it's handled glowing hot—and it's side-loaded on the belt, an invitation to uneven wear. So, all things considered, management wasn't too unhappy with a 700,000-ton average from belts at this big steel mill's coke plant.

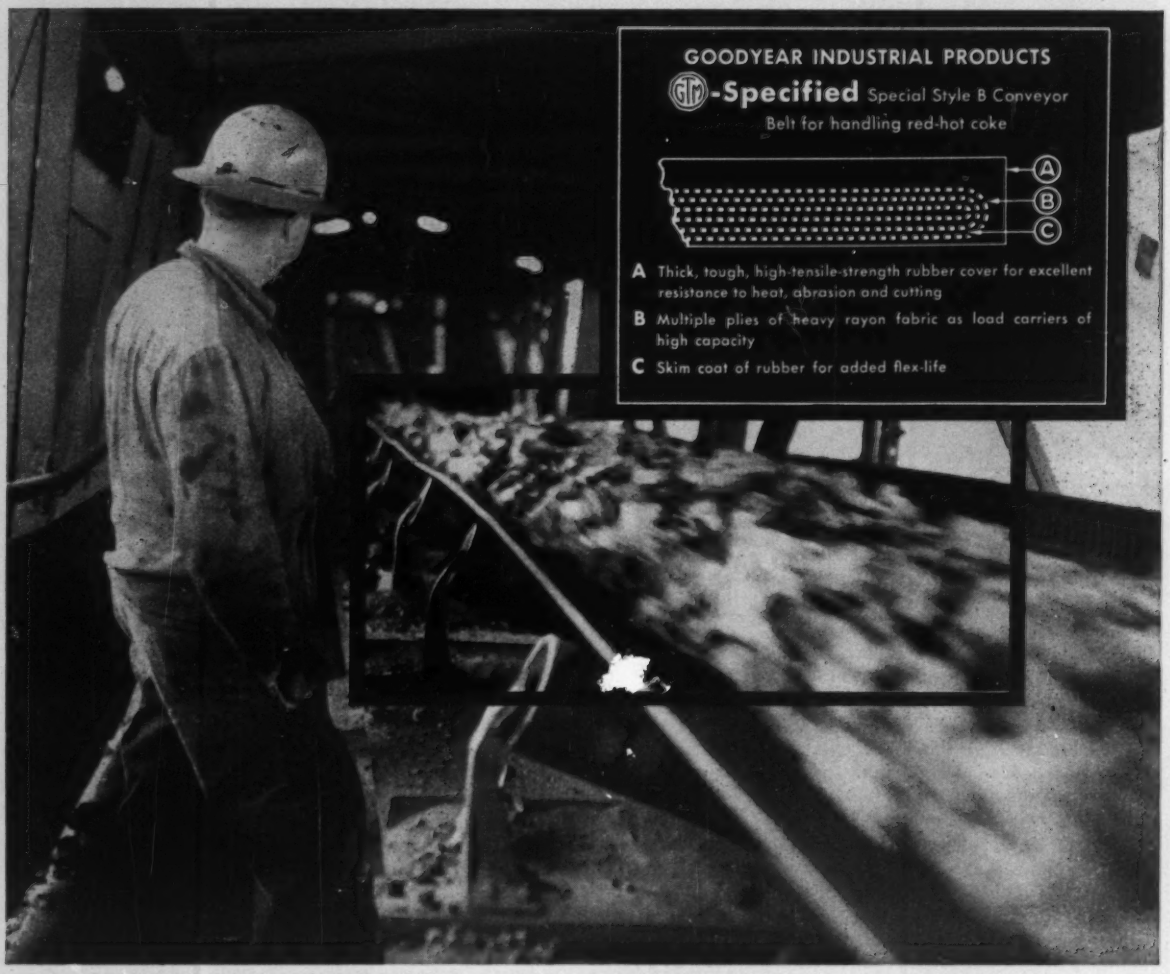
But the G.T.M.—Goodyear Technical Man—knew he could do better than that. His recommendation: a special Style B conveyor sinewed with plies of heavy-duty rayon to defy the abusive service.

And he was right again! In fact, the G.T.M.'s belt hustled almost 1,500,000 tons—better than twice the average of those previously used. And because it troughed better and trained more readily, it proved far easier to reverse for more equalized wear—held its fasteners better—needed less maintenance all around.

And that's just one more case where the G.T.M. had the answer—where competition had fallen far short. To put him to work on your problem, contact your Goodyear Distributor—or write Goodyear, Industrial Products Division, Akron 16, Ohio.

• • •

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and non-rubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

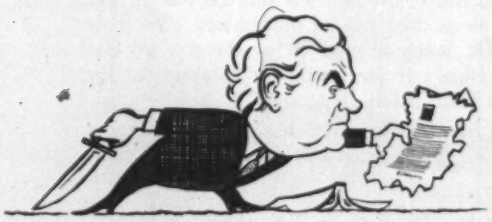


CONVEYOR BELTS BY

GOODYEAR

THE GREATEST NAME IN RUBBER

Please direct all correspondence to attention of Ed Service, STEEL, 1213 W. Third St., Cleveland 13, Ohio. January 4, 1960



We're Flattered

In his Nov. 16 editorial ("Only 51 Days"), Editor Walt Campbell urged metalworking to do a better job of telling the management story in the steel strike. The objective: To gain either a reasonable settlement, or to persuade steelworkers to reject the senseless strike in the forthcoming elections.

Lo and behold! We turn to the November issue of *Steel Labor*, a tabloid published by the United Steelworkers of America, and find his editorial featured in the center of a two page spread headlined: "Don't Be Fooled . . . By Corporation Propaganda." The USW said STEEL's editorial proves the point that USW members would be "targets for slick Madison Avenue public relations campaigns promoted by wealthy, profit-heavy steel corporations . . . We (the members) must . . . make certain that the propaganda plots of industry are exposed for the hoaxes they are."

Who Reads About STEEL?

Through Nov. 23, U. S. daily newspapers mentioned STEEL's coverage of the steel strike 4075 times (more quotes than any other publication). Also, 2259 articles were based entirely on STEEL's editorial content; 84 mentions were made in local newspaper columns and by-lined stories; 124 in editorials; and 1608 in news roundups.

Guess we're guilty of spreading the news. Of course, we launched our coverage more than a year ago, Dec. 1, 1958. (*Steel Labor* please note.)

PRODUCTION EFFICIENCY

Banners like the one above will be decorating STEEL every two weeks for the rest of this year. They herald our new Program for Management series. Thirteen articles will be devoted to Production Efficiency and how you can get it; another 13 will take up Materials Efficiency and how you can gain it.

The first series (it starts next week) will provide guidelines for systematic buying of the right machines for the job at the right time and price.

In the second series, you'll learn of the dynamics of Materials Efficiency. Under ME, companies co-ordinate functions such as metallurgy, purchasing, production and inventory control, traffic, and storage.

Those vital routes to more efficiency can help you ease the pressure from inflation, featherbedding, antiquated depreciation laws, and foreign competition. (See Page 93.)

The need for this series was highlighted by this incident:

Word from Abroad

In answering one of our surveys, a U. S. manufacturer said: "We have 50 year old machines, and they're still running. Isn't that something?"

We think it is, especially after we got this letter from K. D. Thomas, Purchasing Dept., W. E. Sykes Ltd., London, England:

"Thanks for your Metal Selector. It will be invaluable to our technical sales department and will be a tremendous help to us in giving better service to our North American customers.

"We enclose a copy of our general catalogue (machines and tools). We reckon we produce some of the best gear machines in the world! We hope we can persuade the American nation of the truth of this! (Such modesty!)"

No Payola in Metalworking, Please

Scandals in the record distributing and broadcasting industries give timeliness to a letter mailed to suppliers by Sperry Gyroscope Co., Great Neck, N. Y. Sperry says its policy "prohibits the acceptance of gifts by any of its employees at any time."

What Do You Settle For?

" 'Our Chip Making Inefficiency Is a National Disgrace,' but the subject made an excellent article by Horace Frommelt in the Nov. 23 issue, p. 78," writes P. S. Tatus, supervisor, Work Standards, Methods, and Production Analysis Section, Tractor & Implement Div., Ford Motor Co., Birmingham, Mich. "We would like six extra copies for our people."

The editors know that the article has been discussed at meetings of machine tool users, and ex-

Introducing...
METALOK MORTAR

WALSH'S ANSWER TO THE PROBLEM OF JOINT EROSION IN LADLES AND FIREBRICK FURNACE LININGS

Shipped in 100 lb. bags ready for mixing

Used in laying up Walsh Ladle brick, Metalok successfully retards penetration of metal and slag... reduces joint erosion to the barest minimum — definitely increases ladle lining life.

For greater satisfaction and improved service in slab, reheat and other metallurgical furnaces, get acquainted with new Metalok. A trial will convince you. Write today for the complete money-saving story.

Specialists in Refractories of High Bulk Density and Low Porosity

WALSH REFRACTORIES CORPORATION
101 FERRY ST. · ST. LOUIS 7, MO.
FOR OVER 60 YEARS MANUFACTURERS OF HIGH GRADE REFRACTORIES

amined by many companies and associations.

You may recall that Mr. Frommelt, director, Spring Garden Institute, Philadelphia, said: "The desire to keep cutting tools on the job as long as possible is the cause of inefficiency. We baby a $50,000 machine tool to preserve a 20 cent cutting edge. If you settle for shorter tool life, you can boost machining rates."

We'd like to know who has adopted this philosophy. A brief letter will do.

We Sum Up Seven Months

On June 1, when the Servicenter was a nameless babe just out of swaddling clothes, we announced that this was a place to send your questions—and get answers.

We've thumbed through the hundreds of inquiries sent to us since June 1 to give you an idea of what we've been doing. Here's a cross section:

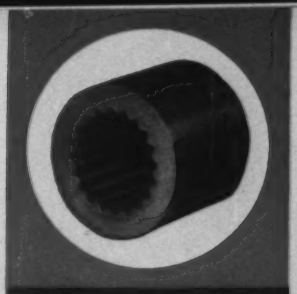
"Who designs and builds steel plants?"
"How much iron ore does Canada export annually?"
"What were the total sales of aluminum and steel during 1957-59?"
"Could you tell me the earliest methods of smelting and alloying used by Egyptians and Assyrians?"
"What firms make electric cars?"
"Can explosives be used to harden crankshafts?"
"What equipment is used to blend powdered metals?"
"Do you have a chronology of metalworking events dating from 1929?"
"Have you published anything on selection of jigs, fixtures, and gages?"
"How much steel will the U. S. consume from 1965 to 1980?"
"Who makes inspection equipment for testing castings?"
"Where can I get information on service center (warehouse) sales?"

If you have a question or problem, send it to us. We don't guarantee results, but we can provide leads that will put you on the right trail.

Watch for Contest Results

The 1959 auto production year is now a matter of record—in a few weeks we'll present the winner of a scale model of General Motors' Firebird III and the next best guessers who will get full color prints of a dream car rendered by George W. Walker, Ford vice president and director of styling. They'll be readers who Beat-the-Experts at predicting automobile production for the last six months of 1959.

Another Meta-Dynamics Division development in *"Chipless machining"!*



Ratchet
Material—AISI C-1020
Operation—Form I.D.
Production—300/hr.

Heat exchanger tubing
Material—Copper
Operation — Form fins
Production — 16″ of tubing formed per minute.

NEW CINCINNATI
Intraform

Rapidly produces complex internal profiles to close tolerances, with low cost tooling.

This new *chipless machining* method makes possible low cost production of parts having intricate I.D. profiles that would be difficult or time consuming to machine by conventional methods.

Hollow cylindrical stock, ferrous or non-ferrous, with open or blind holes, is placed over a mandrel and "kneaded" by rapidly pulsating, rotating dies. The smooth, continuous kneading action redistributes the metal to reproduce the profile of the mandrel in the I.D. of the part. The work is formed to close tolerances and with fine surface finish. Tensile strength and hardness of the metal are also improved.

Work diameters ranging from ⅛″ to 5″ can be cold formed on standard Cincinnati Intraform machines, which can also be used for bonding laminated tubing and for reducing and tapering solid or tubular stock. For a description of the process and its many advantages, write for Bulletin M-2060, or call in a Meta-Dynamics Division field engineer.

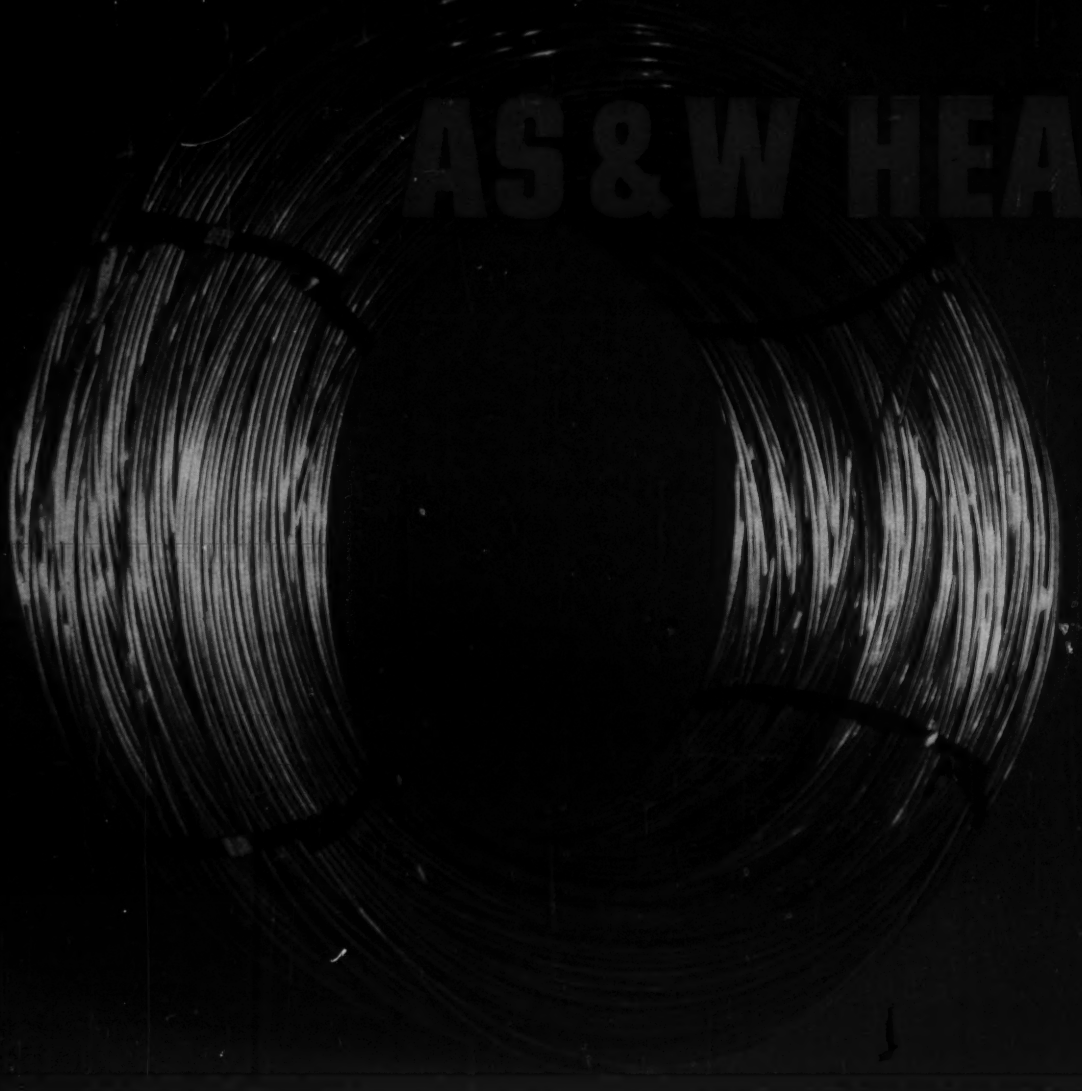
Laminated tubing
Material — Aluminum and copper
Operation—Bond copper lining to aluminum tube
Production — 24″ of tubing bonded per minute.

Left photo shows workpiece prior to Intraform operation. Note mandrel in front of part. Right photo shows workpiece after Intraform operation with profile of the mandrel reproduced in I.D. As workpiece feeds and mandrel does not, only a short, relatively inexpensive mandrel is required. Time for this operation was 16 seconds.

Intraform
META-DYNAMICS DIVISION
Machines for Metal Forming and Heat Treating

THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio, U.S.A.

CINCINNATI



Other new AS&W Wire Packages mean important savings in

UNITIZED COILS:
Several regular mill coils bound in one unit to speed up handling and save storage space. Unitized coils carry no price extra!

PAY-OFF DRUMS:
Large, fibre, disposable carton containing long continuous wire coil. Pay-Off Drum is easy to handle and stack, protects wire finish from dirt and corrosive atmospheres.

DISPOSABLE SPOOLS:
Contain up to 65 pounds of fine wire; are shipped on expendable pallets. These non-returnable spools are convenient to handle and stack.

WEIGHT WIRE COILS

save you down time...

handling time...storage space

...at no increase in cost!

If your mill machines are set up to run with these continuous-wire, heavy-duty coils, they will pay off for you in three ways:

They will speed up your production by eliminating unnecessary down time, unnecessary idling of operators and machines.

They will save handling time. One large coil can be handled in a fraction of the time needed to move the same weight in smaller coils.

They saye storage space. This big coil takes up far less space than the same weight in smaller coils.

And you get all these advantages as standard mill practice. *USS and American are registered trademarks*

USS **American Manufacturers Wire**

---

time and storage!

PLATFORM COIL CARRIER: This non-returnable unit is made of U-shaped wire frame attached to deck platform, holds up to 3,000 pounds of wire in continuous lengths.

All of these new American Steel & Wire Packages are planned to serve you better, to help you use warehouse space to better advantage, to save time and money.

For more information, get in touch with the nearest district office of American Steel & Wire. General Offices: American Steel & Wire, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

American Steel & Wire
Division of
United States Steel

USS

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

interchangeable with all standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1-½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write today to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1. One Piece Piston
2. Hard Chrome Cylinder Bore and Piston Rods
3. High Tensile Steel Tie-Rods
4. Cushion Adjusting Screw, Externally Adjustable
5. New Super-Cushion for air, or Self-Aligning Master Seal for oil (T-J Patents)
6. Solid Steel Heads and Mounting Plates Standard all Models
7. Port Design Allows Minimum Pressure Drop on Inlet or Outlet
8. Chevron Type, Self-Adjusting Rod Packing
9. Piloted Packing Gland—Absolute Alignment
10. Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

T-J TOMKINS-JOHNSON
RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

Stage Set for '60 Industrial Shows

THE 1960 industrial exposition season opens with the **Plant Maintenance & Engineering Show and Conference**, Jan. 25-28, in Philadelphia's Convention Hall. Clapp & Poliak Inc., New York, will manage the event.

New York's Coliseum will be the scene of the **1960 Nuclear Congress**, Apr. 4-7. The Congress includes the Engineering & Science Conference, the National Industrial Conference Board's Atomic Energy in Industry Conference, and the Atomic Exposition. The Engineers Joint Council, New York, is coordinator.

The **American Welding Society's** annual exposition will move to Los Angeles this year. It will be held in the Great Western Exhibit Center, Apr. 26-28.

"A Metalworking Roundup—Southwest Brand" is the theme of the second biennial **Southwestern Metal Congress & Exposition** to be held in the State Fair Park, Dallas, May 9-13. Emphasis will be placed on metals for the aircraft, petroleum, and chemical industries. The American Society for Metals, Novelty, Ohio, is the sponsor.

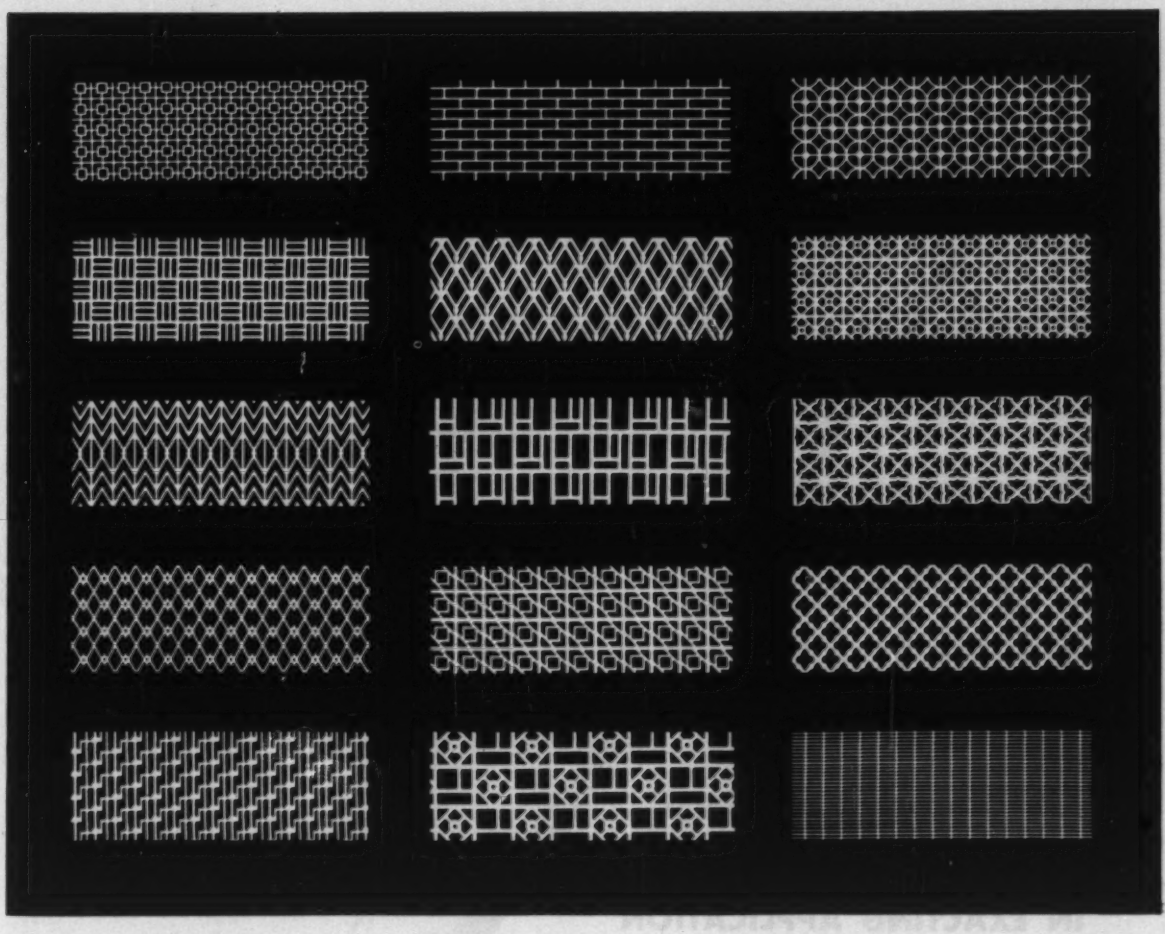
On May 23-26, the **Design Engineering Show & Conference** will be held in New York's Coliseum.

Machine tools will take the spotlight in Chicago this fall. The National Machine Tool Builders' Association will sponsor the **Machine Tool Exposition** in the International Amphitheatre, Sept. 6-16. The **Production Engineering Show** is scheduled for the same dates at Navy Pier. Clapp & Poliak, New York, will handle both shows. The second **Coliseum Machinery Show** will also be held at the same time in Chicago's Coliseum. It will be handled by A. Bryon Perkins & Associates Inc., Los Angeles.

The American Society for Metals' annual national **Metal Exposition & Congress** will be held in Philadelphia, Oct. 17-21, at the Trade and Convention Center.

The first **Industrial Building Exposition & Congress** will close the season Dec. 12-15. Clapp & Poliak Inc., New York, will be in charge.

For other meetings see Page 345.



Why Metalworkers Work With Hendrick Perforated Metal

For well over 80 years the metalworking industry has relied on Hendrick for its perforated metal requirements. And with good reason! Hendrick perforated metal combines decorative beauty with the functional strength so often called for on new product specifications. Hendrick's vast stock of dies includes over 100 unusual patterns that are exclusive and only obtainable from the Hendrick Manufacturing Company.

Hendrick perforated plate is available in every type of commercially rolled metal in gauges and sizes of perforations to meet your exact specifications. For more information call your nearby Hendrick sales office. It's listed in your classified telephone directory under Metals, Perforated. Or —for FREE booklet, mail the coupon, today.

HENDRICK Manufacturing Company
30 Dundaff Street, Carbondale, Pennsylvania

Gentlemen: ☐ Please send me FREE booklet.
☐ Have representative call.

Name_____
Title_____
Company_____
Street_____
City_____ State_____

Perforated Metal • Perforated Metal Screens • Wedge Slot Screens • Hendrick Wedge Wire Screens • Architectural Grilles
Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids • Hydro Dehazers • Distillation Column Internals

TALL ORDER!

ACIPCO 50-FT. MANDREL GIVES LONGER LIFE IN EXACTING APPLICATION

Completely fabricated and machined by ACIPCO, this 50-foot mandrel is giving longer, more durable service to an outstanding producer of power transmission poles, light standards, and other similar equipment. These products are produced by hydraulically forming steel plate around the mandrel.

Type 4330 alloy steel, heat treated to 300 minimum Brinell hardness for wear resistance and strength, was selected for this application. The mandrel—consisting of four ACIPCO centrifugally spun tubes threaded and screwed together—is 24″ in diameter with a 3″ wall and is provided with a 0°20′20″ taper from end to end. The O. D. is finish machined and belt polished to a 125 micro-inch finish to facilitate stripping the poles from the mandrel.

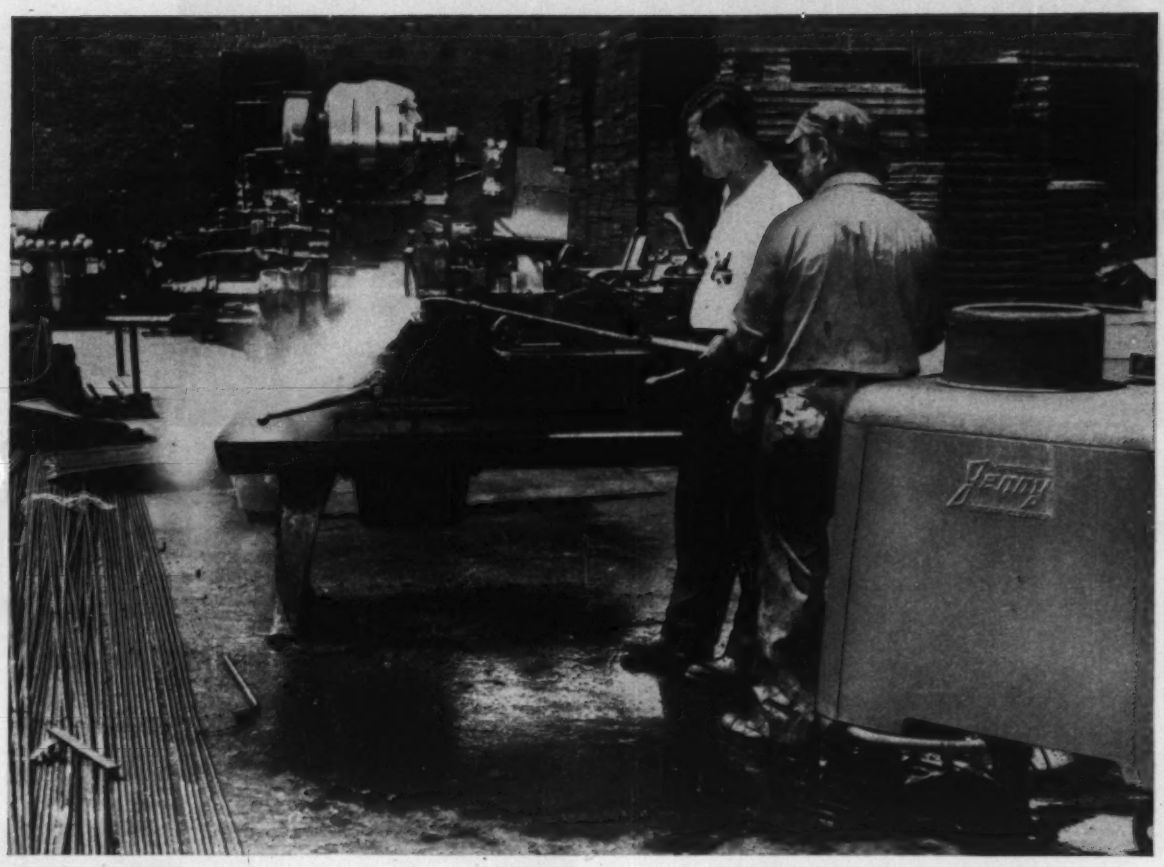
This is another example of ACIPCO versatility in action . . . of how ACIPCO'S wide range of sizes and analyses, and "one source—from start to finish" facilities can solve a complicated steel tubing problem, including YOURS!

ACIPCO

SPECIAL PRODUCTS

DIVISION OF AMERICAN CAST IRON PIPE CO.

BIRMINGHAM · ALABAMA



Jenny® Removes 25 Years of Grime– Slashes Tool Reconditioning Time!

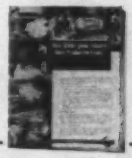
To remove 25 years' accumulation of dirt, grime, and grease from 200 metal working and forming tools, was the problem faced by Mr. John Radzak, Production Manager, Universal Form Clamp Co., Chicago. After trying numerous methods, Hypressure Jenny Steam Cleaner was chosen as the most thorough and economical means of doing the job.

Typical of Jenny's speed and savings was the fact that it cleaned a 100-ton punch press in six hours, as compared with 10 man-days required previously by hand-cleaning methods.

Now, Jenny is used in the company's plant housekeeping program, and it has helped to establish them as one of the cleanest and safest plants in the country.

It will pay you well in profits, production and worker morale to make Jenny the keystone of *your* maintenance and reconditioning programs. With a choice from more than 50 different models of Jenny, including all-electric, oil-fired, or gas-fired types, and ranging in capacity from 35 to 360 gallons per hour, you are sure to get the best Jenny for your cleaning jobs.

Mail the coupon today for additional facts or free demonstration. You'll be glad you did!



98

☐ Please arrange to demonstrate a Jenny.

☐ Send additional information.

Name .....Title .....

Company .....

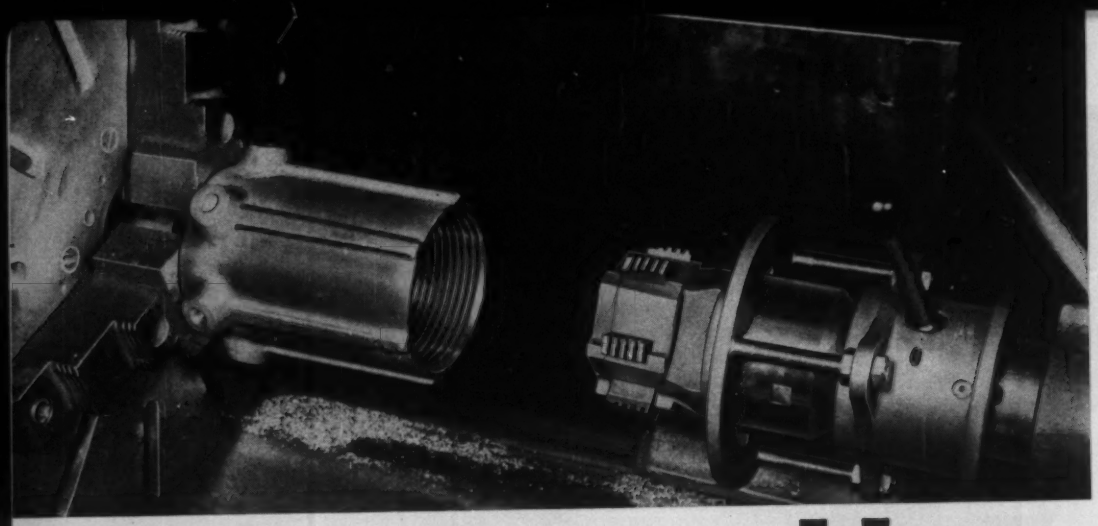
Address .....

City .....Zone.....State .....

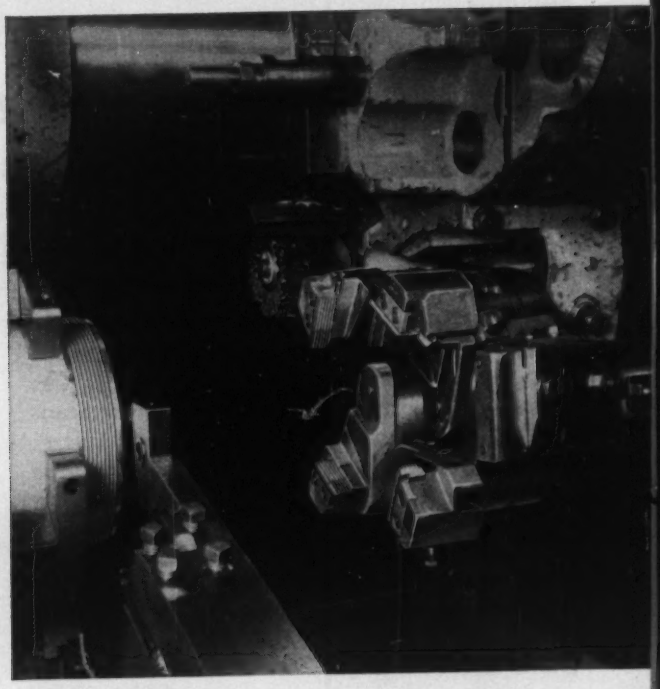
hv

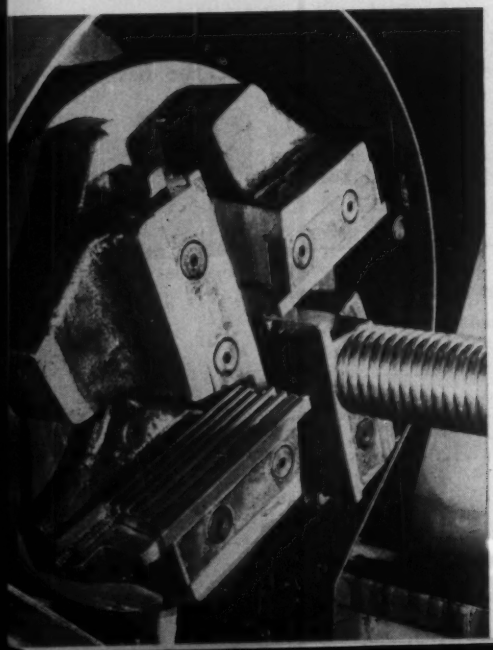
HOMESTEAD VALVE MANUFACTURING COMPANY

Hypressure Jenny Division—Coraopolis, Pa.
(In Canada: Hypressure Jenny Sales & Service, Ltd., 517 Jarvis Street, Toronto 5, Ont. C.S.A. Approved)



the world's largest selection of **thread**





THREADING EFFICIENCY ...

requires the selection of the proper Thread Cutting Tool for the job to be done, and is the essence of LANDIS design. To ensure that you may use the most efficient threading tool, LANDIS manufactures the world's largest selection of Thread Cutting Tools ... both internal and external.

cutting tools

DIE HEADS ... in a range of ⅛"—9¼" for threading machines, turret lathes, screw machines, reversing spindle machines, bar automatics. *Heat-Treated* types for economy, wide range coverage, quick set-up changes and oversize capacity. *Hardened and Ground* types for work on which extreme accuracy and maximum production are of prime importance. *Solid Adjustable* types for high production threading on reversing spindle machines.

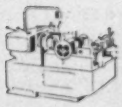
TAPS ... in a range of 1¼"—24". *Collapsible Taps* for producing parallel threads, *Receding Chaser Collapsible Taps* for tapered threads. Both have wide diametrical range through use of detachable heads. *Non-Collapsing Solid Adjustable* types for high production tapping on reversible spindle machines. Special Taps are available.

CHASERS ... all Landis Die Heads use Landis Tangential Chasers featuring: interchangeability, natural cutting clearance, permanent throat, useable for most of their length, right- and left-hand threads with the same chasers, and changeable rake and lead angles. Landis Tap Chasers, manufactured with the same consistency of quality and experience as the Tangential Chaser, are "tailor-made" to suit the application to produce a high degree of thread finish and the maximum number of pieces between grinds.

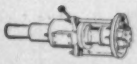
The constant research for better threading methods which has brought to LANDIS leadership in its field today plays an even more important part in our activities. We offer all manufacturers our over 50 years experience in all phases of Threading. If you need help involving threads, whether design or production, or if you feel that your present threading methods should be improved, send us your specifications, or our representative will call at your convenience on request.

LANDIS *Machine* COMPANY WAYNESBORO PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT


Threading Machines

Die Heads – Rotary & Stationary


Taps – Collapsible & Solid Adjustable

Centerless Thread Grinding Machines

Thread Rolling Tools

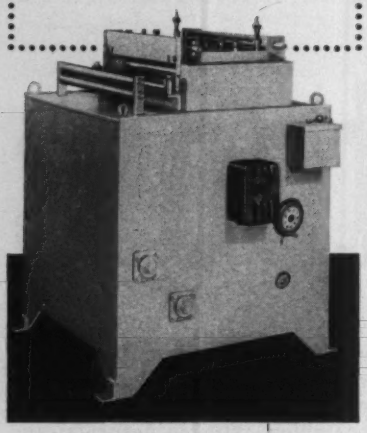
Thread Rolling Machines

553C

new

benchmaster

Combination Feeding and Straightening Machine



Feeds measured lengths of coiled, strip or flat stock to presses, shears and other machines. Simultaneously removes kinks, moderate curl, camber, etc., with 9 adjustable power-driven rolls. Equipped with electro-magnetic clutch drive and adjustable timer for delivering measured feed lengths.

TWO MODELS: Single clutch for nominal feed accuracy or double clutch for increased feed accuracy. Standard feed range 0-60". Alternate ranges on request. Special timer bypass extends range to any length required. Models available for material to 50" wide, various gauges. Larger sizes are available on special order.

WRITE FOR NEW DESCRIPTIVE CIRCULAR!

benchmaster

World's largest manufacturer of small punch presses and mills.

1835 West Rosecrans Avenue, Gardena, Calif.

STEEL
The Metalworking Weekly

Editor-in-Chief, IRWIN H. SUCH

Editor, WALTER J. CAMPBELL

Associate Managing Editors, VANCE BELL, JOHN S. MORGAN

WILLIAM E. DEAN .....News Editor
WILLIAM M. ROONEY .....Market Editor
ROBERT F. HUBER .....Machine Tool Editor
EDWARD N. CASE .....Metallurgical Editor
HARRY CHANDLER .....Copy Editor
GLENN W. DIETRICH ..Associate Copy Editor
FRANK R. BRIGGS .....Associate Editor
ROBERT O. JAYNES .....Associate Editor
ROSS WHITEHEAD .....Associate Editor

GEORGE J. HOWICK .....Associate Editor
NEIL C. ROBERTS .....Associate Editor
DERRY EYNON .....Assistant Editor
DONALD E. HAMMERSTROM..Assistant Editor
JOHN TERESKO .....Assistant Editor
WILLIAM M. OLDS .....Assistant Editor
ALFRED M. CASTELNAU .....Assistant Editor
MARY T. BORGERHOFF .....Assistant Editor
MARY ALICE EARLY .....Assistant Editor
EILEEN CORTES .....Assistant Editor

MARY ANN STUVE, JANE WEDGE, Editorial Assistants

THOMAS H. BRYAN, TOM WELSH, Art Editors

IRENE KASNER, Editorial Service

Resident Editors

New York 17 .....60 E. 42nd St.
B. K. PRICE, L. E. BROWNE
BRIAN WILSON
Murray Hill 2-2581

Chicago 11 .....520 N. Michigan Ave.
ERLE F. ROSS, AUSTIN E. BRANT
Whitehall 4-1234

Pittsburgh 19 .....2837 Koppers Bldg.
WILLIAM V. WALLACE—Atlantic 1-3211

Detroit 35 .....15800 W. McNichols Rd.
A. DONALD POSTMA—Broadway 3-8150

Washington 4 ....1123 National Press Bldg.
JOHN R. BOTZUM—Executive 3-6849

Editorial Correspondents

Buffalo—Emerson 5385 ....GEORGE E. TOLES
Youngstown—Riverside 7-1471..GEO. R. REISS
Cincinnati—Beechmont 1-9607...DICK HAVLIN
Birmingham—Birmingham 3-1121 R. W. KINCEY
St. Louis—Garfield 1-1212 HAMILTON THORNTON
Houston—Hudson 6-5236 .....ROBERT SHIRK

Los Angeles—Webster 5-1234..NORMAN LYNN
San Francisco—Yukon 6-5151 EDWIN HAVERTY
Seattle—Melrose 2-1895 .....R. C. HILL
Toronto, Canada—Empire 4-9655..F. S. TOBIN
Birmingham, England .....J. A. HORTON
Brussels, Belgium .....PAUL DE KEYSER

Dusseldorf, Germany, DR. HERBERT GROSS

BUSINESS STAFF

Business Manager, D. C. KIEFER

Asst. Business Mgr.....C. A. TALLINGER JR.
Advertising Service Mgr. ...DORIS MITCHELL
Production Manager .....A. V. ANDERSON
Classified Advertising .....EVELYN DIETZ

Promotion Director .....S. F. MARINO
Market Research Mgr. ....T. M. BALLANTINE
Circulation Director .....J. C. GERNHARD
Distribution Manager .....G. R. EBERSOLE

Reprints, JUNE SCHILENS

Advertising Representatives

New York 17 .....60 E. 42nd St.
K. A. ZOLLNER, GUY LABAW
Murray Hill 2-2581

Wynnewood, Pa. (Phila.) 200 Wynnewood Ave.
WM. J. VERSCHOOR—Midway 2-6512

Farmington, Conn. .....12 Farmstead Lane
CALVIN FISHER JR.
Orchard 7-1756

E. Rochester, N. Y. .....217 Ridgeview Dr.
HAROLD A. DENNIS—Browning 1-2105

Pittsburgh 19 .....2837 Koppers Bldg.
J. C. SULLIVAN—Atlantic 1-3211

Cleveland 13 .....Penton Bldg.
J. K. GILLAM, N. W. MANNING
Main 1-8260

Cincinnati 6 .....2215 Victory Parkway
E. L. FRANKE—Parkway 1-0711

Detroit 35 .....15800 W. McNichols Rd.
DONALD C. HYDE
Broadway 3-8150

Chicago 11 .....520 N. Michigan Ave.
L. C. PELOTT, W. L. POLAND
WM. J. D'ALEXANDER, RICHARD BIRDSONG
Whitehall 4-1234

Los Angeles 36 .....5943 W. Colgate Ave.
F. J. FULLER—Webster 1-6865

San Francisco 4 .....57 Post St.
Robert W. Walker Co.—Sutter 1-5568

Griffin, Ga. .....112½ E. Solomon St.
FRED J. ALLEN—Griffin 8-8681

Clearwater, Fla. .....1954 Jeffords Dr.
H. G. ROWLAND—(Clearwater) 31-4121

Dallas 35 .....818 Exchange Bank Bldg.
JAMES H. CASH—Fleetwood 1-4523

BPA

NBP

Published Every Monday by
THE PENTON PUBLISHING CO., Penton Bldg., Cleveland 13, Ohio
MAin 1-8260

GEORGE O. HAYS .....Chairman
RUSSELL C. JAENKE .....President
FRANK G. STEINEBACH .....Vice President and Secretary
FRANK O. RICE .....Vice President
JOSEPH P. LIPKA .....Treasurer and Assistant Secretary

Also Publisher of
FOUNDRY, MACHINE DESIGN, NEW EQUIPMENT DIGEST, AUTOMATION
Member of Business Publications Audit of Circulation Inc., Society of Business Magazine Editors, and National Business Publications Inc.

METALOGICS

find out about this new science on the next three pages . . .

METALOGICS

RYERSON PLUS VALUES

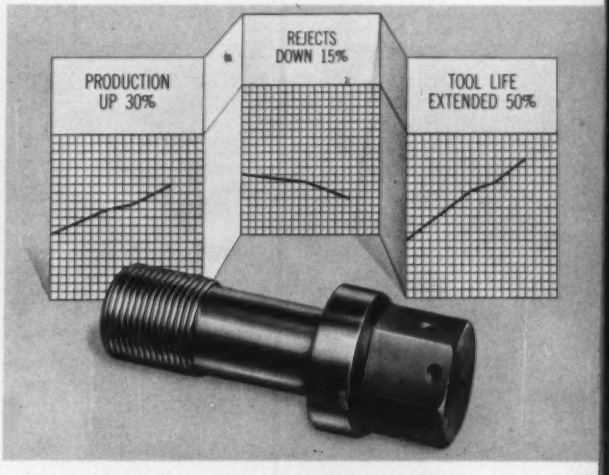
...the Ryerson science of giving optimum value for every purchasing dollar

Metalogics at work... IN STEEL

Both good steels—but only one was right for the job. Severe stresses imposed by this forming operation caused a high rate of reject for a fabricator using hot rolled plate to the usual ASTM-A7 spec. A Ryerson specialist suggested change to Ryerson welding and forming plate—a prompt solution to a costly problem.

Missile component problem solved. Titanium stringers in stainless forged bars were creating a high reject rate for a missile parts manufacturer. His Ryerson specialist recommended a switch from Type 321 stainless to Type 347. Result: the same stabilized corrosion-resistance and strength—but no titanium stringers.

The need was urgent. A breakdown was cutting output of a big paint producer, but steel to repair the break was not available locally. A call to the nearest Ryerson plant 200 miles away resulted in delivery of 100′ of bar stock at the airport an hour later. Three and one-half hours after calling Ryerson in another state, the customer had his steel.



Value analysis boosts production 30%. This was the outstanding result when a metalworking company studied and evaluated production of piston pin boltheads with a Ryerson representative. He recommended Rycut® 40—the world's fastest machining alloy steel in its carbon range. Other results: rejects reduced 15%... tool life increased 50%... better finish.

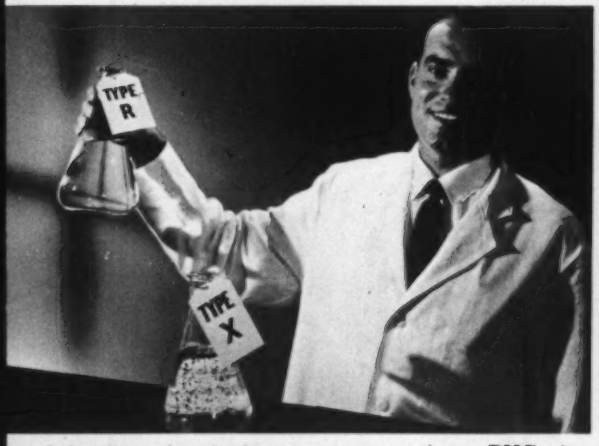
Metalogics at work . . . IN ALUMINUM

Furniture manufacturer saves 15¢ per unit on every chair produced. A *rolled* aluminum angle in 6061-T6 alloy was being used where strength was not an important factor. A Ryerson aluminum specialist suggested an *extruded* angle in 6063-T5 which gave all the strength needed in the application, was more easily formed, had better appearance—and reduced costs as well.

Better product appearance and a saving in material cost resulted when a Ryerson man recommended that a producer of portable coolers switch from one aluminum alloy (3003-H14) to another (5005-H14). Slightly higher structural strength was a bonus value. Unusually broad aluminum stocks and technical resources often enable Ryerson to serve in this way.

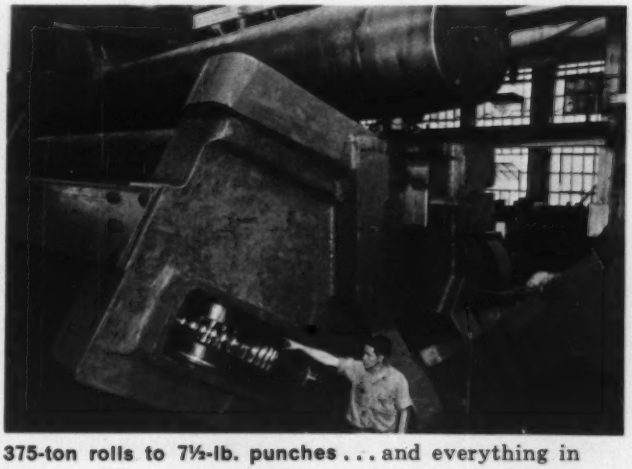
Also plus values in . . .

INDUSTRIAL PLASTICS



A leading chemical company was using a PVC pipe that included synthetic rubber for high-impact strength in producing 50% hydrochloric acid. But the acid ate away the rubber, leaving particles in the solution. The old pipe was replaced by Ryertex®-Omicron PVC, which contains nothing to contaminate the acid and has *natural* high-impact strength. Results thus far: 18 months of trouble-free service at 125° F. and maximum pressure of 40 psi.

METALWORKING MACHINERY



375-ton rolls to 7½-lb. punches . . . and everything in between. Whatever you need in metalworking machinery, call Ryerson. Over 3800 types and models available—everything from this huge bending roll to small hand punches. The Ryerson line includes machinery for bending, braking, drilling, forming, hoisting, pressing, punching, rolling, sawing, shearing, threading and welding. Ryerson also offers a complete, special line of material-handling equipment.

METALOGICS—see details of complete program on next page

METALOGICS

...how it works for you

Broadens Scope of Selection

Know a single source where you can get aircraft-quality alloys such as 9310, Nitralloy, and 4340 to A.R.T.C.-14 . . . as well as all standard commercial alloys and free-machining types? This is typical of the size and diversity of Ryerson stocks. Here, right at the tip of your dialing finger, are thousands of tons of steel and aluminum—in virtually every standard type, size and shape. Also, hard-to-get intermediate sizes and special analyses are readily available. This is true of Ryerson stocks, year in and year out—in all but periods of extended production shutdowns.

Brings Newest Developments

Remember when lead was first added to carbon steels for faster machining . . . when, a little later, leaded alloys came along? Ryerson stocked them for you first. And remember just recently when the world's fastest machining steel tubing and bars (Ledloy® 170 tubing and Ledloy 375 bars) were introduced? Again, Ryerson brought them to you first.

Gives New Measure of Quality

Quality—now there's a word that's worn thinner than an office-seeker's shoe sole. But Ryerson Metalogics has given it new meaning, with a brand-new set of rigid quality-control standards that are completely detailed and published for your scrutiny. They govern every aspect of specifications, verification, packaging, cutting and certification of all Ryerson products. If you want a tangible example of the scope of this new quality program, take a good look at Ryerson cutting tolerances. Then see if you can find any that are held more closely.

Provides Best Technical Help

"Expert" is another worn-out word we hesitate to use. But we do put at your disposal the industry's most experienced men. They're ready to give you the benefit of their nationwide, daily experience with all kinds of problems—material selection, fabrication and the ever-present specter "cost of possession." And remember, nowhere else will you find as wide a range of published technical information to help you in your metalworking operations. It's yours for the asking.

Builds Solid Business Relationship

Here's a company you should get to know better for our primary business is that of satisfying customers. And we've kept a lot of people satisfied over the last 100 years. We'd like to satisfy you, too.

Meets Most Exacting Schedules

What do you need right now . . . tomorrow . . . or in the future? Whatever you need, Ryerson is there —"the fastest with the mostest"—exactly when you need it—as you need it.

Why not discuss the exciting story of Metalogics with your Ryerson representative soon. You'll find he can help you in more ways than you might think —to meet all your requirements for steel, aluminum, plastics and metalworking machinery.

Be "METALOGICAL"—call Ryerson

METALOGICS
RYERSON PLUS VALUES

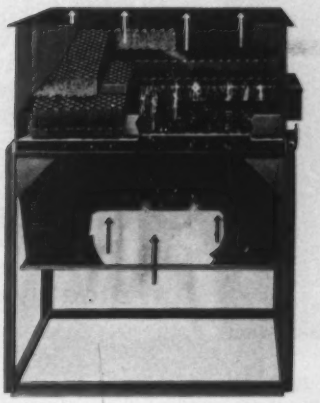
STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY

RYERSON STEEL

Joseph T. Ryerson & Son, Inc., Member of the INLAND Steel Family

PLANT SERVICE CENTERS: BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON • INDIANAPOLIS
LOS ANGELES • MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS • SAN FRANCISCO • SEATTLE • SPOKANE • WALLINGFORD

This new unit stops destructive plant mists and vapors



This is the Type M Cycoil, newest product of AAF dust control research. It is a special dust collector designed to do a specific job: collect the mists and vapors that ruin automobile finishes, plant roofs and neighborhood home exteriors. It does its job well. It is higher in efficiency, lower in cost, lighter in weight and less space-consuming than conventional collectors used for this service. Bulletin 286 describes the Type M Cycoil in more detail.

AAF

American Air Filter

BETTER AIR IS OUR BUSINESS

Mr. Robert Moore
American Air Filter Company, Inc.
443 Central Avenue, Louisville, Ky.

Please send me Type M Cycoil Bulletin 286.

Name_____

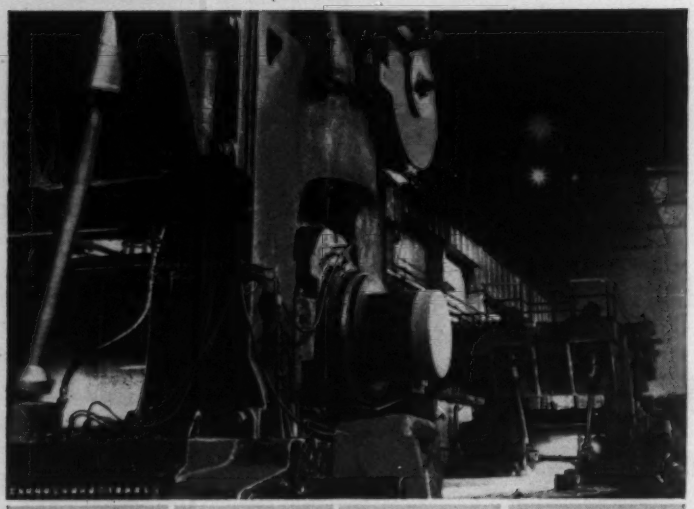
Company_____

Address_____

City_____ State_____

In Canada: American Air Filter of Canada, Ltd.,
400 Stinson Blvd., Montreal 9.

ENGINEERED OIL SEALS for Steel Mills



Model 64

Model 142

Model 53

Model 21 or 23

FULL BEARING PROTECTION IN SEVEREST ATMOSPHERES

Everywhere in steel—on hot and cold strip mills, blooming and structural mills—Garlock KLOZURE* Oil Seals prevent leakage of vital bearing lubrication. And they further prevent damage to the bearings by sealing out scale, spray, dirt, and other foreign matter.

For example, Model 142, a face-type KLOZURE, is designed to seal surfaces perpendicular to shaft . . . keeps water splash and scale out of bearings at the shoulder of mill rolls. Models 64 and 82 are applied to large shafts at normal or high speeds . . . ideal for protecting bearings on back-up and work rolls. Model 53 withstands temperatures up to 250°F at normal or high speeds . . . recommended for table rolls. Where equipment can't be dismantled easily, Models 21 or 23 Split-KLOZURES are the choice.

All KLOZURES are oil and grease resistant . . . impervious to water, mild acids, alkalies . . . non-abrasive . . . withstand temperatures from −40°F to +250°F. For extreme conditions, Garlock furnishes sealing elements resistant to practically any fluid, and serviceable as high as +500°F.

Sealing Element, case, spring, and adapter on KLOZURES are designed for peak efficiency and durability. Garlock, with 70 years' experience and modern production facilities, manufactures KLOZURE Oil Seals in proper design and to extremely accurate dimensions from materials which are best suited for your application. Engineering skill, vast experience, and mass production know-how bring you the finest oil and grease seals available.

Obtain more information by calling the nearest of Garlock's 26 sales offices and warehouses throughout the U.S. and Canada. Or, write for KLOZURE Catalog 30. The Garlock Packing Company, Palmyra, N.Y.

GARLOCK

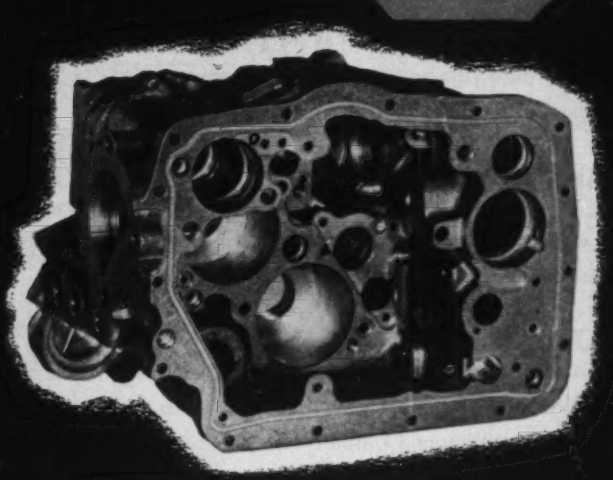
Canadian Div.: The Garlock Packing Company of Canada Ltd.

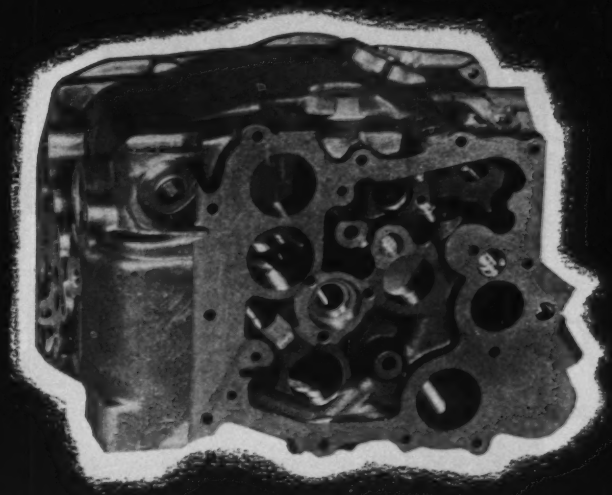
Plastics Div.: United States Gasket Company

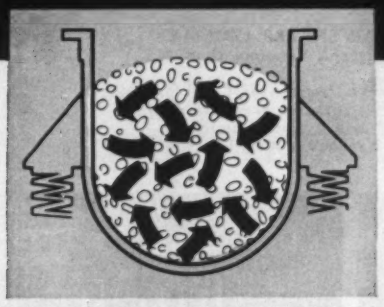
Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*Registered trademark

CALL ON **ROTO-FINISH RANSOHOFF** FOR *Finishing Results* LIKE THIS . . .







CONSTANT OVERALL ABRASIVE ACTION—The Vibratron work zone extends throughout the abrasive mass. Every surface is subject to constant vibrating abrasive action.

NO MORE MANUAL HANDLING of parts and media. A built-in removable separator does the job. There's no need for an extra separator.

COMPLEX ALUMINUM CASTINGS DEBURRED 2 at a time . . . in 15 minutes . . . . . the **VIBRATRON** way!

Woodward Governor Co., Rockford, Ill., long a leading manufacturer of all types of governors for prime movers, manufacture such highly precise equipment as jet engine fuel control systems. Precise finish and dimensional tolerances are a must! The fuel control shown above was previously hand deburred and then tumbled in a multiple compartment machine for 1 hour. Now . . . these cases are processed *2 at a time in 15 minutes* in the Vibratron. No hand operation is required and the finish is more uniform.

IF YOU NEED HELP ON A FINISHING PROBLEM, *Write or Phone today* FOR FULL PARTICULARS. IT WILL PAY YOU TO GET THE FACTS ON VIBRATRON PROCESSING.

ROTO FINISH

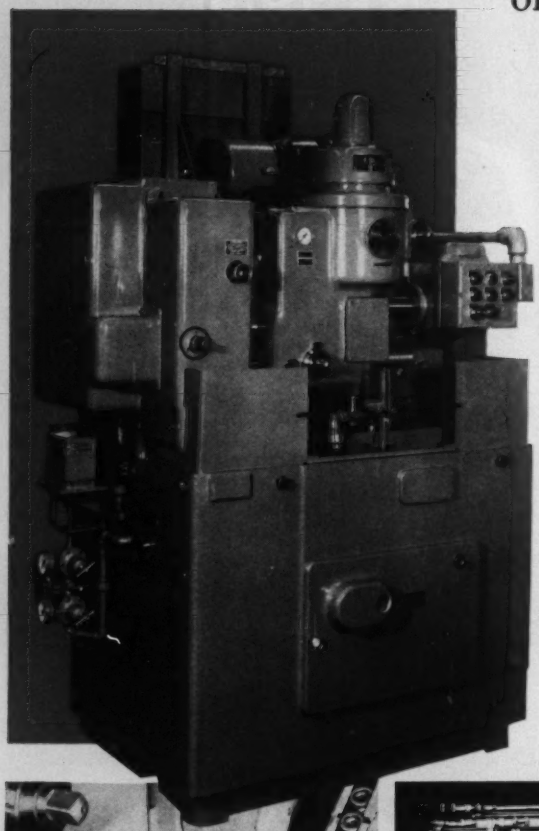
ROTO-FINISH / RANSOHOFF

3717 Milham Road, Kalamazoo, Michigan — Phone: Fl reside 3-5578

FOREIGN REPRESENTATIVES: ARGENTINA—Taller—Buenos Aires ● AUSTRALIA—A. Flavell Ltd.—Cheltenham ● BRAZIL—Commercial E. Industrial de Fornos Werco, Ltd.—Rio de Janeiro ● CANADA—Canadian Hanson & Van Winkle Co., Ltd.—Toronto ● ENGLAND—Roto-Finish Ltd.—Hemel Hempstead ● FRANCE—Societe Roto-Finish—Paris ● GERMANY, AUSTRIA, NORWAY, SWEDEN, SWITZERLAND—Metallgesellschaft A. G.—Frankfurt, a. M.—Germany ● HOLLAND, BELGIUM, LUXEMBURG—N. V. Roto Finish Maatschappij—Delft, Holland ● ITALY—Societa Roto-Finish a R. L.—Milan ● MEXICO—Enthone de Mexico, S.A. Prol Pina 689, Mexico 15, D. F. ● SPAIN—Instituto Electroquimico, S. A.—Barcelona

AUTOMATIC WORK HANDLING

Is A Natural Complement to the High Production Rates of the Fellows 4GS Gear Shaper

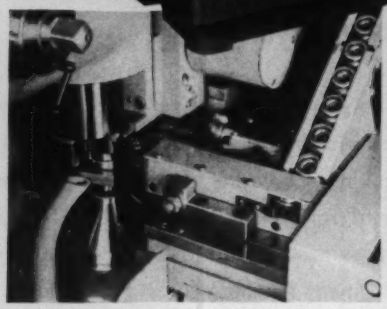


Although designed for both manual and automatic loading, the 4GS Fellows Gear Shaper makes best use of its high production rates when equipped with work handling devices.

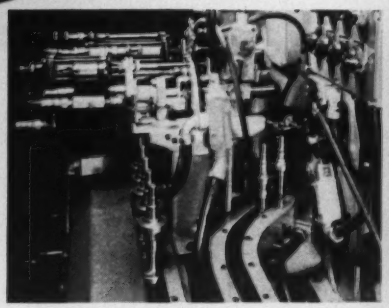
The physical construction of the machine is such that it may be easily adapted for use with magazines and chutes for automatic loading and unloading at substantial cost savings on continuous production runs.

Ask your Fellows representative about the many advantages of automatic work handling with the 4GS Fellows Gear Shaper, or write direct to the Fellows Gear Shaper Company.

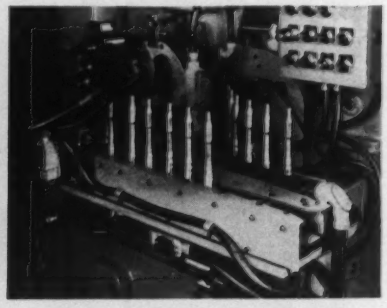
THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont, U. S. A.
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45



These internal clutch parts are fed automatically from a vibratory feeder down a chute to the magazine slide from which they are located and clamped. The cutter spindle is automatically stopped at the top of its stroke for clearance during the loading and unloading cycle. Cutting time is 1½ minutes. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, Spur, 5/32″ Face Width.



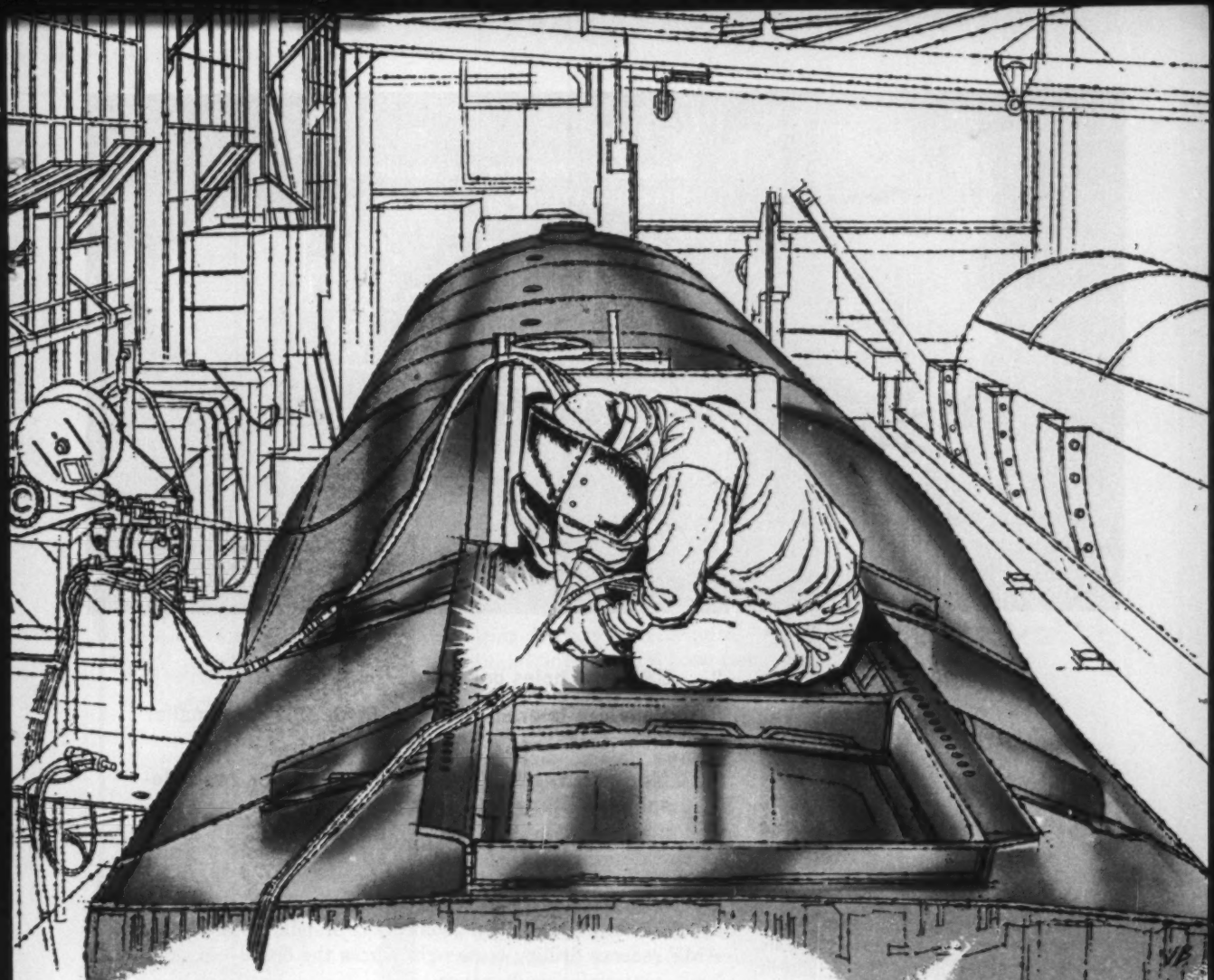
This transmission cluster gear shaft is handled by two sets of air-operated "fingers" mounted on a turret. As the turret rotates, one set of fingers moves the finished piece to the unloading chute while the other set brings the new blank into position. Cutting time is 35 seconds. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, External Spur, 5/32″ Face Width.



This automotive stem pinion is handled in the same manner as the cluster gear. In both cases, safety devices prevent the machine from starting unless the blanks are in the correct cutting position. Loading and unloading chutes may be hand or conveyor fed. Cutting time is 2½ minutes. *Gear Data:* 17 Teeth, 10 Pitch, 19° 30′ Pressure Angle, 32° 51′ Helix Angle, 5/8″ Face Width.

THE PRECISION LINE

Fellows *Gear Production Equipment*



Formula for Success

The formulation of a stainless steel alloy requires as much precision as any chemical compound. All the care exercised in the selection of a particular alloy can be nullified by variations in the analysis specified.

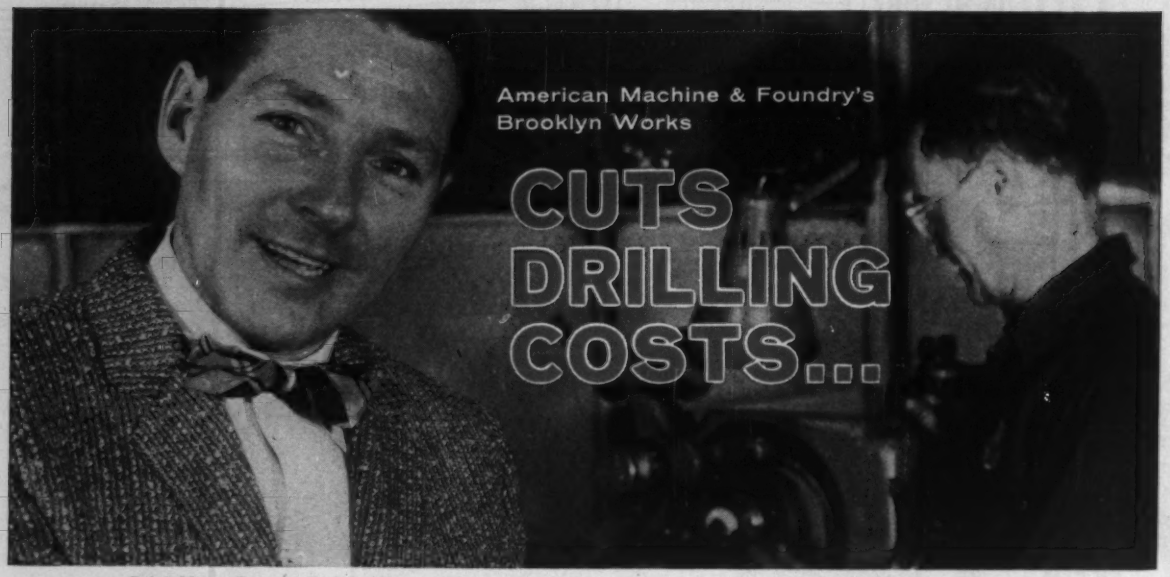
During fabrication, for example, slight differences in chromium-nickel: carbon ratios can cause changes in microstructure which lead to early failure.

That's why it is safer to specify J&L Consistent Quality Stainless Steel. J&L leads the industry in melt shop standards for stainless steel—the point where quality starts, **and longer service life begins.**

Plants and Service Centers:
Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit

STAINLESS
SHEET • STRIP • BAR • WIRE

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34



Ralph Mazza, Foreman, Tool Grinding and Small Tool Department

At AMF, the Cincinnati SPIROPOINT sharpens spiral point drills for 10 radials, 60 sensitive drill presses and 20 multiple-spindle multiple head units.

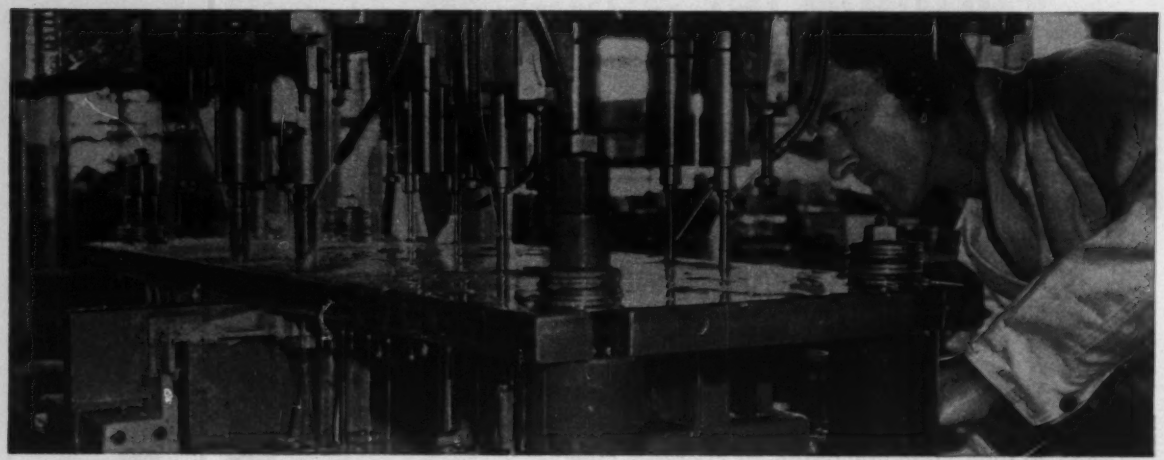
"... 20% more holes per grind"

"... Hole size tolerances of .0015" to .002" on smaller diameters"

"... More than 15% less downtime on our multiple-spindle drilling machines"

"... Less costly fixtures required"

By using Cincinnati SPIROPOINT® Drill Sharpener to apply the new *spiral point* geometry to standard twist drills, AMF reduces drilling costs right across the board—in time, tools, materials, maintenance.



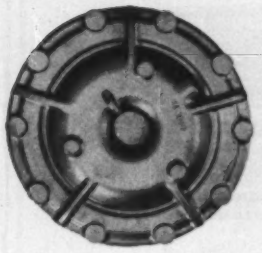
Ask your Cincinnati Lathe and Tool Dealer about SPIROPOINT— or write to us direct.

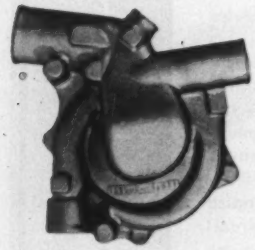
CINCINNATI LATHE AND TOOL CO.

3207 Disney Street, Cincinnati 9, Ohio

"HYDRASHIFT" Lathes/"CINCINNATI" Drilling Machines/"SPIROPOINT" Drill Sharpeners

lower production costs with Decatur quality castings





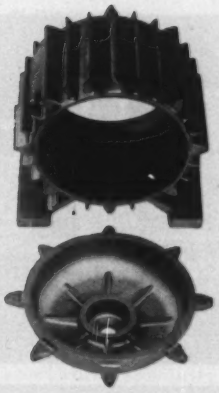
In the highly competitive field of gray iron castings, buyers constantly seek greater reliability at lower cost. They lower costs by using castings which require minimum finishing and have the lowest rejection rate.

Decatur Quality Castings® have exceptionally smooth surface finish comparable to shell or permanent mold castings. When required, precisely controlled heat treating in our furnace gives these castings the uniform metallurgical properties necessary for high production machining. Preparation of unmachined areas is usually unnecessary.

Decatur castings are shipped to your plant in our trucks when quantities permit to insure prompt service.

We are light gray iron and alloyed iron specialists supplying castings weighing a few ounces to 100 pounds.

D®



THE DECATUR CASTING CO.

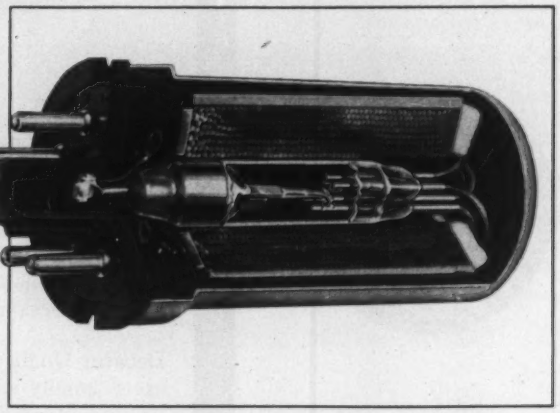
Decatur Quality Castings® Light Gray Iron and Alloyed Iron Specialists
Decatur, Indiana • Phone: Decatur 3-2700

BISHOP Tubular Products NEWS

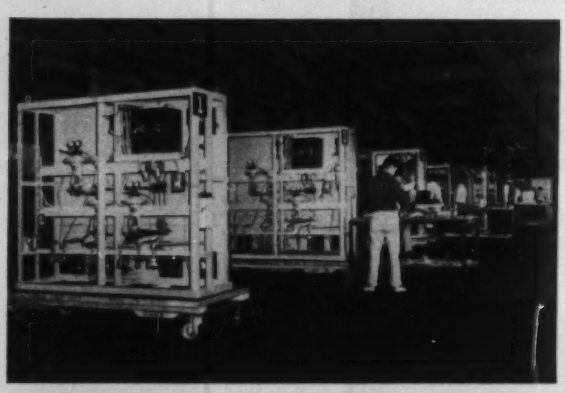
"METALS FOR PRECISION AND PERFORMANCE"

C. P. CLARE'S MERCURY-WETTED CONTACT RELAYS PERFECTLY SEALED WITH GLASS-TO-METAL SEALING ALLOY

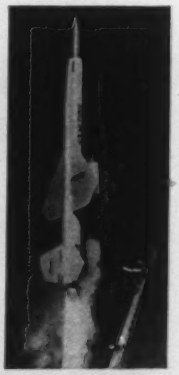
C. P. Clare & Company, Chicago, Illinois, produces a complete line of mercury-wetted contact relays characterized by long life, high speed of operation and no contact bounce. To supply relays that have a conservative life expectancy of more than a *billion* operations requires absolute perfection in all phases of manufacturing. C. P. Clare uses BISHOP's #52 alloy tubing for the critical tubular stems of these relays. Mercury and hydrogen at 150 psig are introduced through this connecting stem—which is then sealed off by welding and forging. Can glass-to-metal sealing alloys solve any of your problems? BISHOP makes a complete line . . . use the coupon for details.



TUBING TAKES 5,400 PSI IN HONEYWELL'S MISSILE CHARGING SYSTEM



Super pressure stainless steel tubing connects many components of the cubicles illustrated. Minneapolis-Honeywell's Missile Equipment Division, Pottstown, Penna. builds these control cubicles that make up the gas charging system for the Bomarc missile. BISHOP supplies Honeywell with two sizes of 304 seamless super pressure tubing for this application. During charging of the missile, tubing handles pressures up to 5,400 psi. If you use small diameter tubing—super pressure, commercial quality or other—consider BISHOP. Use the coupon for a copy of BISHOP's Tubular Products Bulletin.



J. BISHOP & CO.

platinum works

FOR HELPFUL DATA USE THIS HANDY COUPON

- ☐ Glass-To-Metal Sealing Alloy Data
- ☐ Tubular Products Bulletin No. 12
- ☐ Special Tubing Data
- ☐ Platinum Products Catalog No. 4

Check information you'd like and mail to J. BISHOP & CO., 30 King St., Malvern, Penna.

Name

Position

Company

Address

City Zone State

Tubular Products Division

30 KING STREET, MALVERN, PENNA.

NIagara 4-3100

THIS IS THE BISHOP LINE:
Products of all the Platinum Metals... Small diameter Stainless Steel, nickel and special alloy tubing

Mack-Hemp rolls are right for every mill

IN BLOOMING MILLS...

For resistance to side wear: Mack-Hemp *Superalloy* nickel-chrome-moly steel blooming mill rolls produce the tonnage in mills where side wear in the passes has been severe. Sets of *Superalloy* rolls have gone 900,000 tons and more to worn-out diameter!

Where firecracking is a serious problem: Mack-Hemp *Technalloy** chrome-moly steel rolls, specially heat treated, offer excellent resistance to firecracking and breakage under heavy operating conditions.

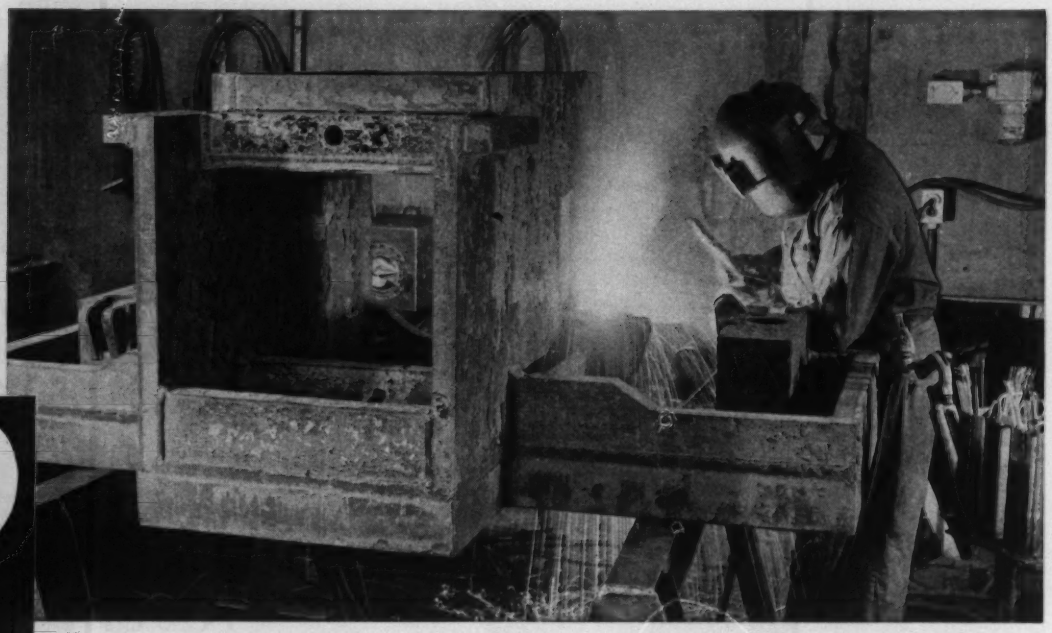
For average conditions: Heat-treated Mack-Hemp *Technisteel* carbon steel rolls provide excellent bite and good wear resistance at low initial cost.

Let us help you get exactly the right rolls for *your* blooming mills. And remember, roll service records show that *you get more tonnage from the rolls with the striped red wabblers.*

*A registered trademark—E. W. Bliss Company

MACKINTOSH-HEMPHILL • DIVISION OF E. W. BLISS CO.

Pittsburgh and Midland, Pa.

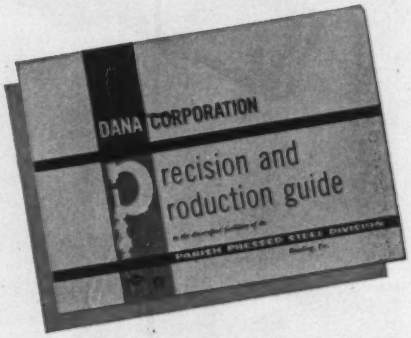


Cut YOUR Production Costs With Parish Weldments!

Parish has the overhead handling facilities, movable partitions and available floor space to handle *any* of your weldment jobs—and cut your production costs! For years Parish welders have skillfully handled jobs from one-of-a-kind to volume production in a wide variety of metals and alloys, ranging in thickness from forty-eight thousandths up to several inches.

At Parish every conceivable welding method is being combined with rigid engineering quality control to fabricate stronger, lighter, more accurate weldments—at lower cost to you.

Parish weldments completely eliminate the inherent danger of "blow holes" which often boost production costs of iron castings.



An illustrated booklet describes the diversified facilities available to you at Parish. Write now for your free copy.

©1959 Dana Corporation

PARISH PRESSED STEEL

DANA Division of Dana Corporation / Reading, Penna.

● **DANA PRODUCTS:** Transmissions • Universal Joints • Propeller Shafts • Axles • Torque Converters • Gear Boxes • Power Take-offs • Power Take-off Joints • Rail Car Drives • Railway Generator Drives • Stampings • Spicer and Auburn Clutches • Parish Frames • Forgings

QUALITY CONTROL

That's the secret of good breeding . . . and why Federal Ball Bearings are all champions.

Take race grinding: the operator must gage race diameter, roundness, contour, centerline, eccentricity of raceway with O.D., parallelism of the race with the face of the bearing ring . . . and finish. Then line inspectors double check.

This is typical of the quality control all along the Federal production line. Double work? Sure! But it means a bearing as close to perfection as a bearing can get. One that's twice as reliable, too. That's why they're specified by so many top industrial companies. Why not put them to work yourself? Start today by sending for the Federal catalog where you'll meet hundreds of different type ball bearings . . . all top breed . . . in 12,000 sizes!

The Federal Bearings Co., Inc., Poughkeepsie, N. Y.

One of America's largest ball bearing manufacturers

Federal

BALL BEARINGS

FEDERAL ON FILM—A 16 mm. color sound film takes you through our 400,000 sq. ft. plant. Loaned free. Just ask for it.

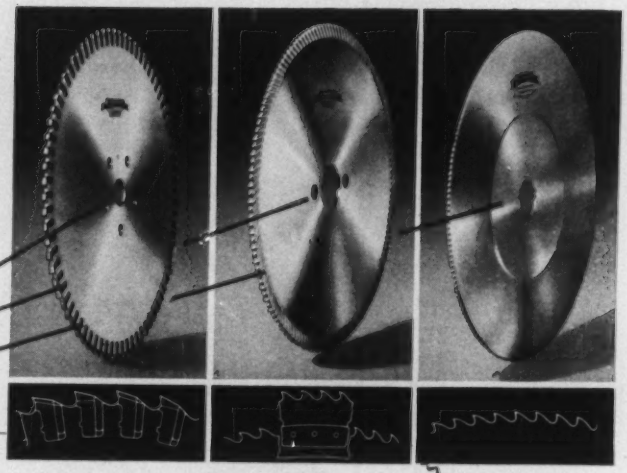
Do you cut ferrous metals? If so, Simonds has three basic saw designs for you:

INSERTED TOOTH METAL SAWS

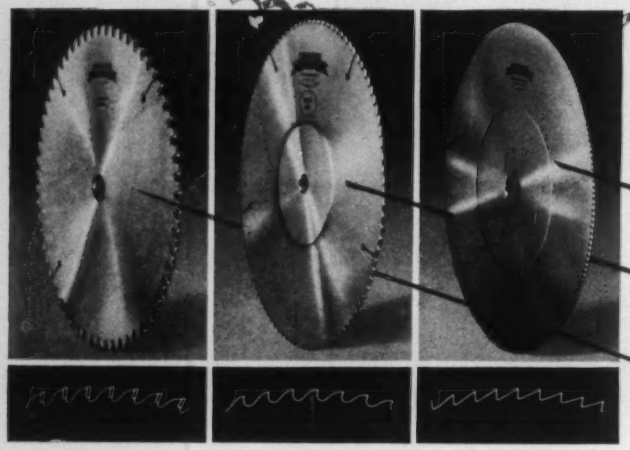
SEGMENTAL SAWS

SOLID TYPE SAWS

Available in High Speed and Semi-High Speed Steels



There's a SIMONDS Circular Saw Exactly Right for Your Metal Cutting Job



If you're cutting non-ferrous metals, Simonds offers you:

SOLID STEEL SAWS
Available in "Si-Maloy", in High-Speed Steel for cutting where extreme abrasiveness is present, and in Semi-High Speed Steel.

HIGH SPEED STEEL, HARD RIM SAWS
Hard cutting edge, soft center gives you long life coupled with safety.

CARBIDE TIPPED SAWS
for cutting aluminum and magnesium, as well as other non-ferrous metals

No matter what kind of metal you're working, there's a quality Simonds blade just right — a blade that means faster, cleaner cuts, longer blade life and maximum performance.

Find out how a Simonds Circular Metal Cutting Saw can mean an important savings for you.

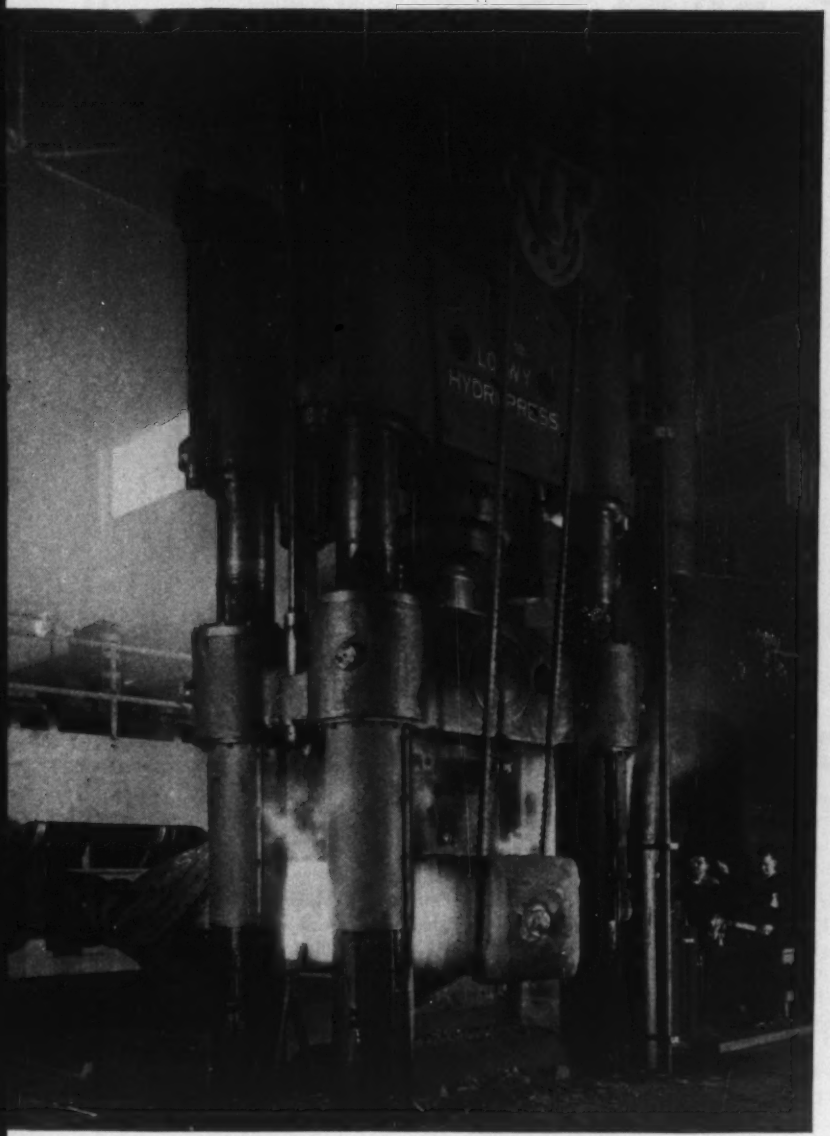
For Fast Service from Complete Stocks
Call your
SIMONDS Industrial Supply DISTRIBUTOR

INDUSTRIAL DISTRIBUTION — FIRST HAND OF PROTECTION

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, Meridian, Miss., Shreveport, La., San Francisco and Portland, Ore., Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que.

From Loewy presses... high-quality steel forgings faster and bigger!



Loewy 2000-ton fast-forging press at Colonial Steel Co., a division of Vanadium-Alloys Steel Co.

Vanadium-Alloys Steel Company, a leading producer of tool and special steels, recently announced the completion of a $3,500,000 expansion program, including a powerful Loewy 2000-ton-capacity forging press now in operation at Vanadium's Colonial Steel Co. Division, in Monaca, Pa.

"The use of this press," according to the customer, "will greatly speed up deliveries of forgings and at the same time offer a more uniform product with better quality control."

Due to its large daylight and die bed dimensions, the press will handle ingots measuring from 12 to 40 inches square and weighing from 1 to 10 tons. A wide range of materials, such as bearing steels, ultra-high-strength missile and aircraft steels and high-temperature alloys will be used in the forging operations to produce an extensive variety of products.

Leading alloy-steel makers praise Loewy fast-forging presses for their trouble-free operation and for the fact that they impart to special steels "internal qualities never before achieved." Equally important, they consistently outproduce conventional hammers and blooming mills.

Loewy forging presses are designed for full accessibility of tooling, easy supervision and maintenance. Fast closing, working and return speeds cut down idle time and prevent heat loss in the workpiece. Strokes per minute for planishing are unsurpassed by any other type of forging equipment. Pressure, tonnage and speed can be varied within a wide range to suit special requirements.

Loewy-Hydropress designs and builds open and closed die forging presses ranging from the smallest sizes to the enormous capacity of 50,000 tons. For further information, write Dept. B-1.

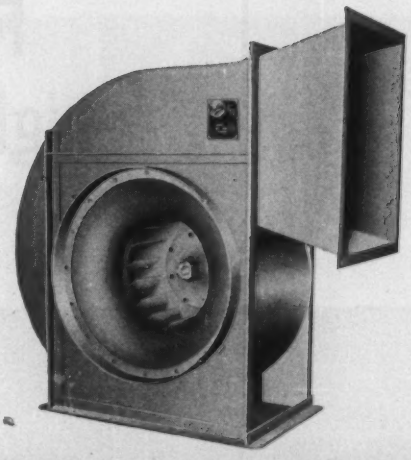
Loewy-Hydropress Division

BALDWIN · LIMA · HAMILTON

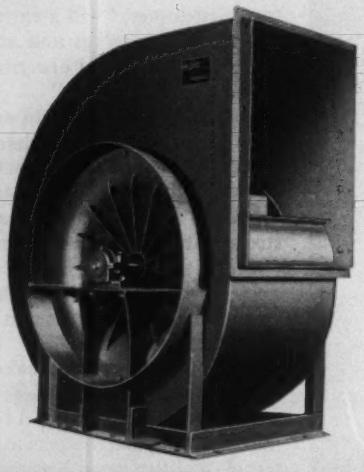
111 FIFTH AVENUE, NEW YORK 3, N.Y. Rolling mills • Hydraulic machinery • Industrial engineering

BALDWIN BLH LIMA-HAMILTON

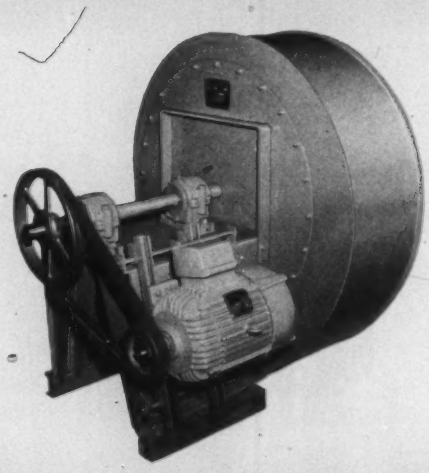
Realize the Lower Cost of Quality Fans



"Buffalo" Type "CR" Fan



"Buffalo" Type "BL" Fan



"Buffalo" Industrial Exhauster

Without a doubt — the dependable performance of quality built fans pays off in longer, more effective, trouble-free service. At Buffalo, we call this the "Q" factor . . . the highest quality you can get. Here are 3 examples of what this can mean to you . . .

For supplying moderate pressure ventilating, air conditioning and air cleaning systems, the "Buffalo" Type "BL" Fan is ideal. From inlet through wheel to housing, the "BL" is engineered for quiet, efficient, economical operation. The "Buffalo" designed non-overloading characteristic assures stable output from free delivery to shutoff. Buffalo's traditional durable construction assures long, maintenance-free life. Capacities to 500,000 cfm. Write for Bulletin F-104.

For severe industrial service the "Buffalo" Type "CR" Fan is unsurpassed. Fan efficiency is increased by the same design factors that reduce wear to a minimum. A unique radial blade plus maximum streamlining through the entire fan accomplishes this dual purpose. Long, productive fan life is assured by Buffalo's extra-heavy duty construction throughout. For full details, write for Bulletin FD-205.

For rugged air and material moving jobs you can rely on "Buffalo" Industrial Exhausters. Special units will move hot gases from 200° F. to 850° F. For handling corrosive fumes, actual users prove that "Buffalo" Rubber-Lined Exhausters will outlast standard metal fans as much as twelve to one. Efficient material wheels are available for moving emery dust, saw dust, chips, long shavings and many other materials. There's a "Buffalo" Industrial Exhauster to fit your "tough" application. Write for Bulletin FI-110.

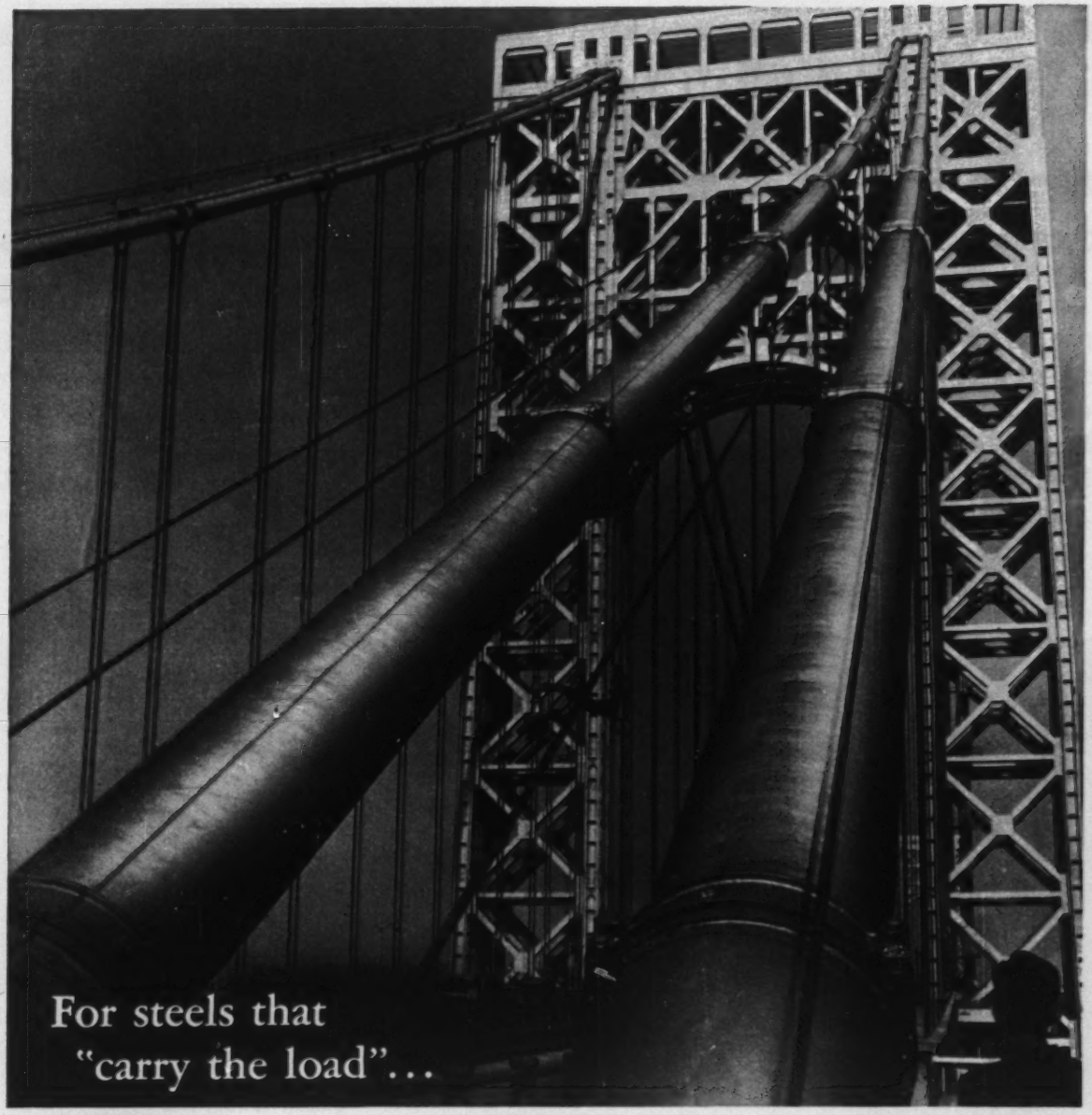
For full information on these and every type "Buffalo" Fan, call in your nearest "Buffalo" Representative. Or write us direct, outlining your air moving problems.

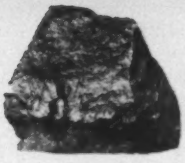
"Buffalo"

BUFFALO FORGE COMPANY
Buffalo, N. Y.

Buffalo Pumps Division Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING





. . . Vancoram Silicomanganese! It makes structural steels tough and strong. In addition to its important alloying properties, Vancoram Silicomanganese acts as a furnace block, desulphurizer and deoxidizer, all in one. Vancoram Silicomanganese comes in every grade you need:

	MANGANESE	SILICON
Max. 1.50% Carbon Grade	65/68%	18/20%
Max. 2.00% Carbon Grade	65/68%	15/17.5%
Max. 3.00% Carbon Grade	65/68%	12/14.5%

Also available, for foundry use, are convenient, square-shaped briquettes containing 2 lb. manganese, ½ lb. silicon. Call your nearest VCA District Office or write for information and recommendations. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N. Y. • Chicago • Cleveland • Detroit • Pittsburgh

VANADIUM
CORPORATION OF AMERICA
Producers of alloys, metals and chemicals

The 20th Century Genie

HARSHAW FLUORIDES

Harshaw first started to manufacture hydrofluoric acid in 1904. Today, Harshaw's Fluoride Division produces 26 different fluoride chemicals for as many industries.

In addition to

BORON TRIFLUORIDE

HYDROFLUORIC ACID—Aqueous-Anhydrous

there is a long list of other fluoride chemicals. If necessary, you are invited to draw on the experience of our staff of technical specialists.

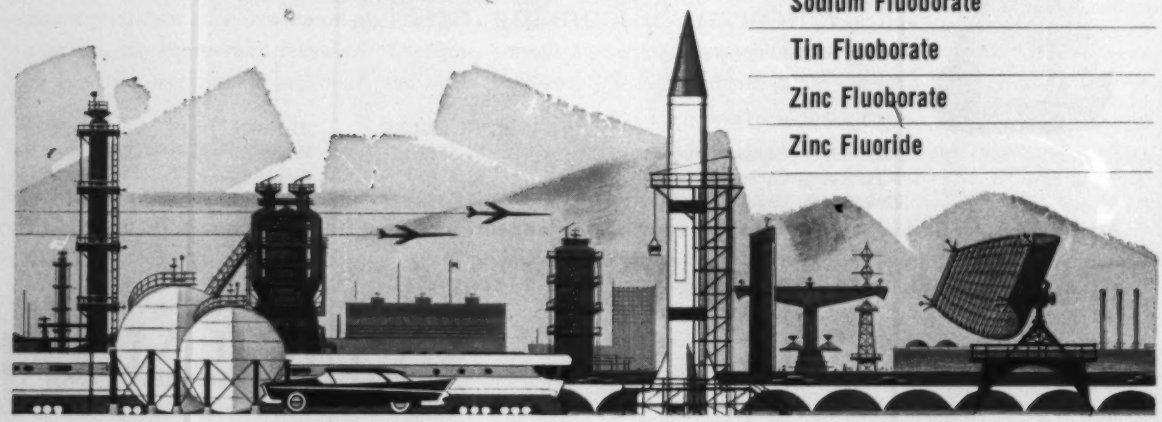
THE HARSHAW CHEMICAL CO.

1945 East 97th Street • Cleveland 6, Ohio

Chicago • Cincinnati • Cleveland • Detroit • Hastings-On-Hudson
Houston • Los Angeles • Philadelphia • Pittsburgh

HARSHAW ALSO SUPPLIES:

- Ammonium Bifluoride
- Ammonium Fluoborate
- Barium Fluoride
- Bismuth Fluoride
- Boron Trifluoride
- Boron Trifluoride Complexes
- Chromium Fluoride
- Copper Fluoborate
- Fluoboric Acid
- Fluorinating Agents
- Frosting Mixtures
- Hydrofluoric Acid Anhydrous
- Hydrofluoric Acid Aqueous
- Hydrofluosilicic Acid
- Laboratory Fluorine Cells
- Lead Fluoborate
- Lithium Fluoride
- Metallic Fluoborates
- Potassium Bifluoride
- Potassium Chromium Fluoride
- Potassium Fluoborate
- Potassium Fluoride
- Potassium Titanium Fluoride
- Silico Fluorides
- Silicon Tetrafluoride
- Sodium Fluoborate
- Tin Fluoborate
- Zinc Fluoborate
- Zinc Fluoride



BLAW-KNOX

engineered production equipment for the Steel Industry

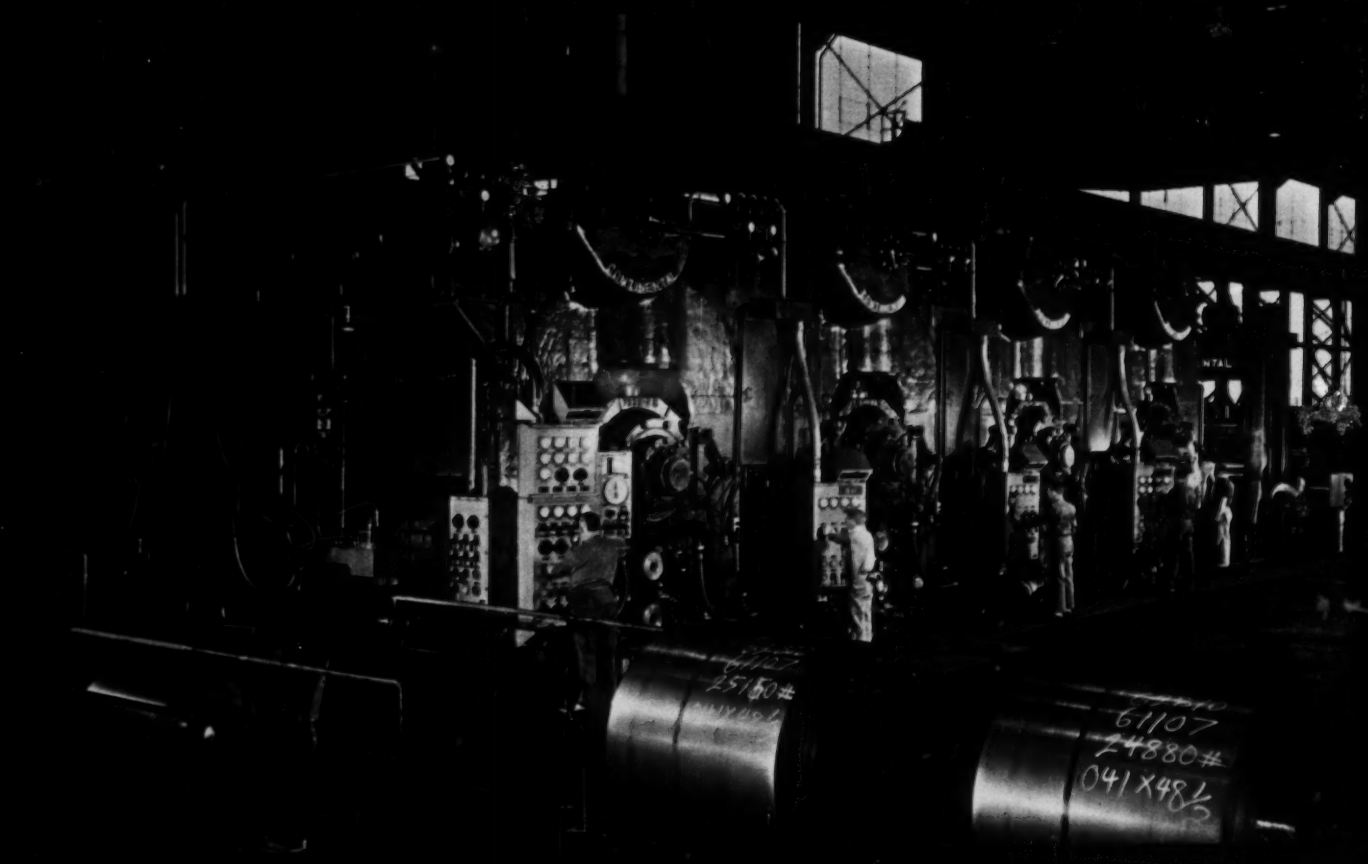
Blaw-Knox offers a complete service for the design, manufacture, and construction of steel rolling, processing, and finishing plants. In addition to these major installations, Blaw-Knox furnishes steel plants with a wide variety of products for use in operations ranging from iron making to cold finishing. The engineering force and plant capacity behind these specialized services and products are unsurpassed in the industry. They will continue to give exceptional service to the steel industry to help meet its constantly increasing production requirements.

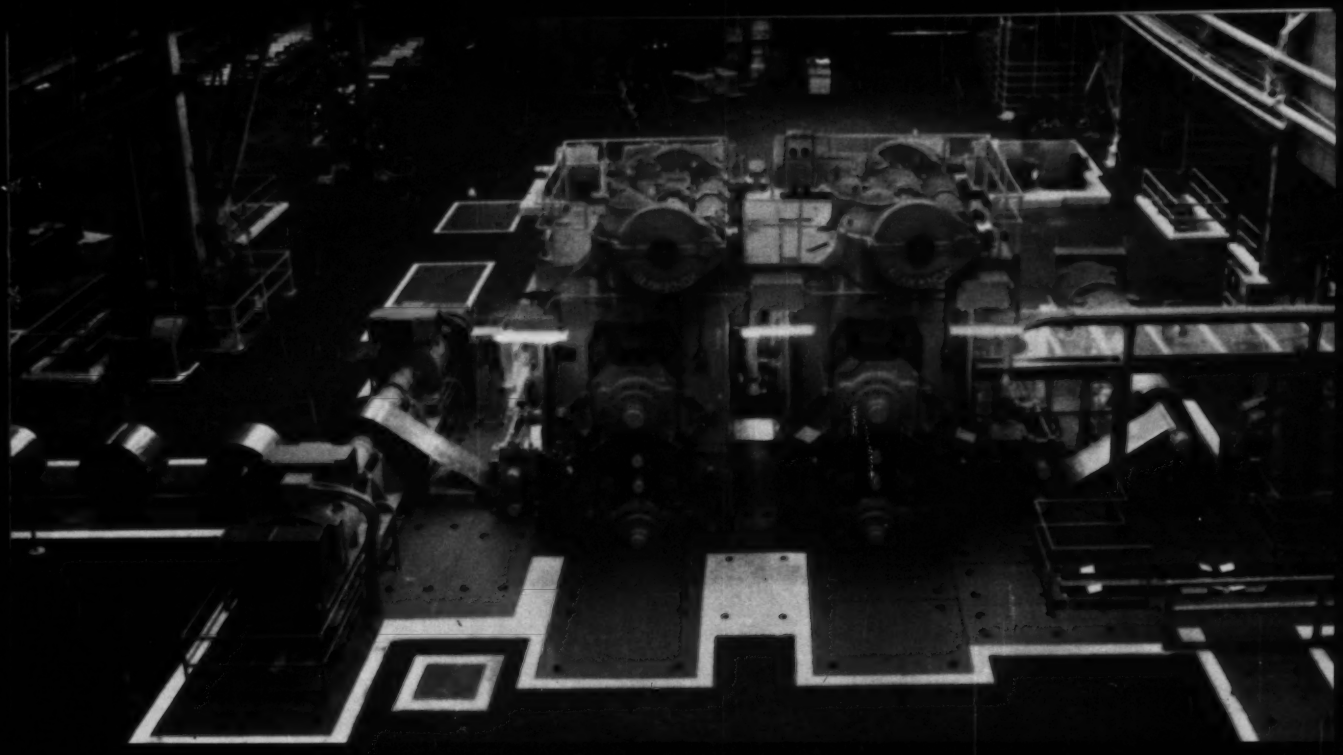
Blaw-Knox Company • Blaw-Knox Building • 300 Sixth Avenue • Pittsburgh 22, Penna.

46- x 90-inch Universal Slabbing Mill

56-inch semi-continuous Hot Strip Mill

60-inch 4 stand tandem Cold Strip Mill



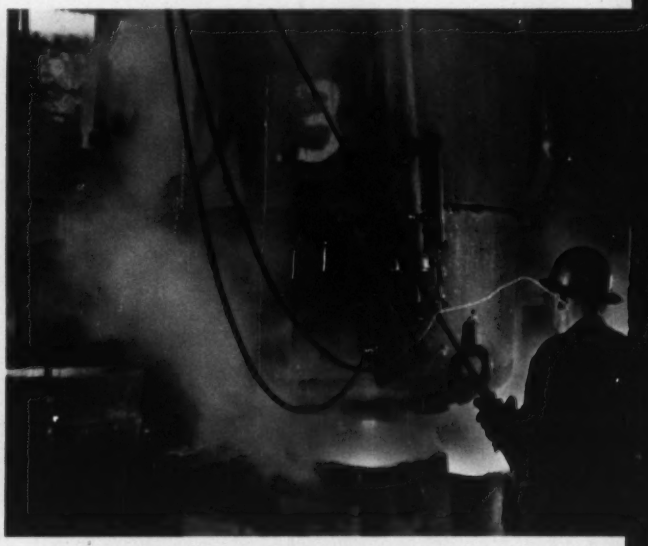


19- and 53-inch x 48-inch 2 stand Temper Mill

Aetna-Standard Continuous Annealing Line

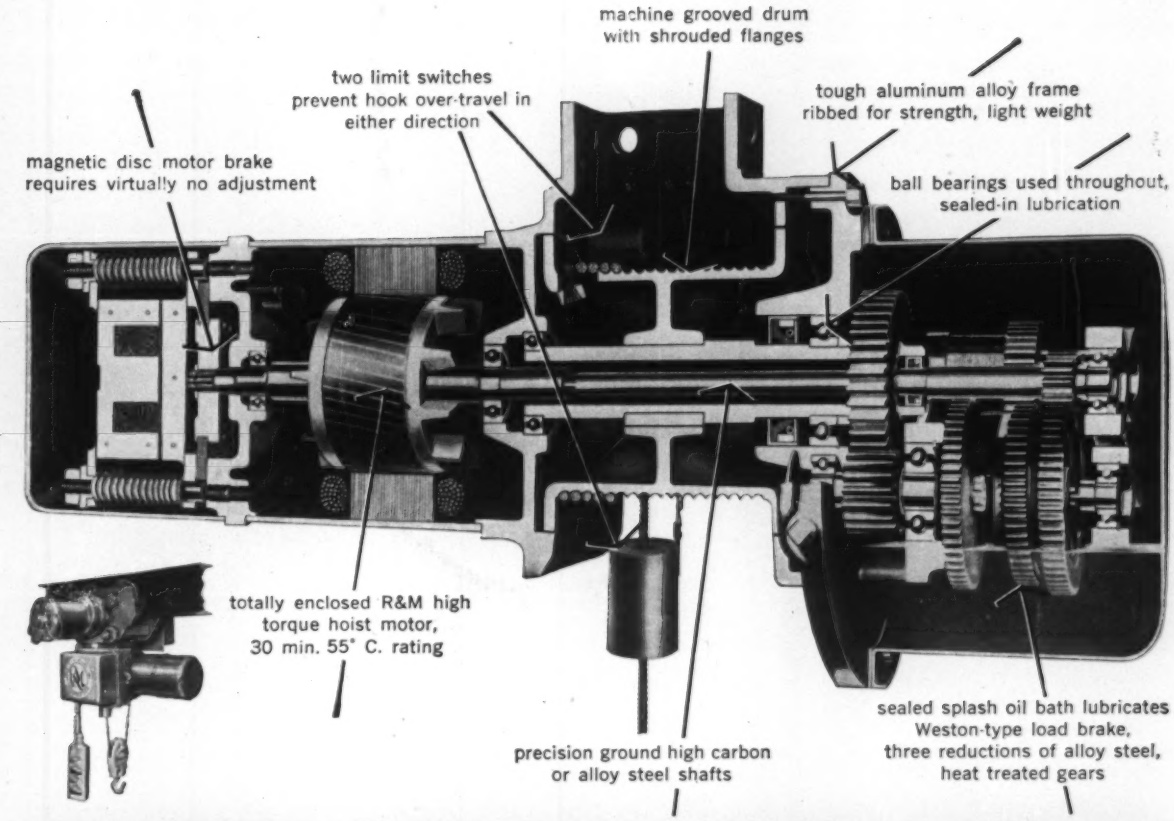
Blaw-Knox Medart Tube Turner uses carbide tools for finishing heavy walled tubing from 9 to 26 inches in diameter.

Blaw-Knox Iron and Steel Foundries furnish Iron, Alloy Iron, and Steel Rolls, Carbon and Alloy Steel Castings, and heat and corrosion-resisting Alloy Castings.



Typical of Blaw-Knox mechanized Steel Plant Accessories is the Autopour® which makes possible safe, automatic teeming of ingots from remote locations on the pouring platform.

BLAW-KNOX



all new! hoist you'd build

R&M Type J hoists, now redesigned, give you the same quality engineering features *throughout* the line that have made Robbins & Myers hoists tops in industrial value. In the low price field the new Type J hoist features a trouble-free disc type motor brake for driftless spotting, and a sturdy Weston-type load brake. Upper and lower jam-proof limit switches, three gear reductions, and liberal use of ball bearings insure reliability. Robbins & Myers hoist motor has the highest time rating found in any low cost hoist—30 min., 55° C. This is the way you'd build it; the price is right, too.

Capacities: ¼, ½, 1, and 2 tons. Lug mounting and push-button control are standard. Push, hand geared, and motor driven trolleys available.

Robbins & Myers, Inc., Hoist & Crane Division, Springfield, O.

take it up with

ROBBINS & MYERS

hoists cranes

Request Bulletin 905 today

CF&I WIRE...

PACKAGED for YOUR PRODUCTION

Reels
(500-800 lbs. capacity)

Disposable Spools
(5-70 lbs. capacity)

Reel-Less Core
(800-1000 lbs.capacity)

Fibre Drum
(250-600 lbs. capacity)

Standard Coils, paper-wrapped,
steel-strapped or wire-tied

This giant steelman – Image of CF&I – stands for the wire that will make more money for you on your production line. In instance after instance, all across the country, manufacturers have reported cutting hours off daily downtime . . . easing storage and handling problems . . . *increasing production as much as 50%* . . . after they started using CF&I Steel Wire – *Packaged For Production.*

Such a record is possible because all CF&I Wire is specifically packaged to give one, or several, special production benefits. For extra hours of uninterrupted production, CF&I has jumbo-sized reels, coils and spools. New STEM-PAKS® and returnable Spiders are especially useful for continuous operations. The smaller Standard Coils and Disposable Spools are easy to handle and store, quick to put in operation. Fibre Drums and paper-wrapped coils are available when wire cleanliness is critical.

CF&I, pioneer in wire packaging, makes wire in a wide range of gages and finishes. Whatever your needs, CF&I can fill them. Call your nearest sales office for full details on the wire that's *Packaged For Your Production.*

CF&I-WICKWIRE WIRE

CF&I STEEL

THE COLORADO FUEL AND IRON CORPORATION

In the West: **THE COLORADO FUEL AND IRON CORPORATION** – Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso
Farmington (N. M.) • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland
Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita

In the East: **WICKWIRE SPENCER STEEL DIVISION** – Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York
Philadelphia

CF&I OFFICE IN CANADA: Montreal • **CANADIAN REPRESENTATIVES AT:** Calgary • Edmonton • Vancouver • Winnipeg

7407

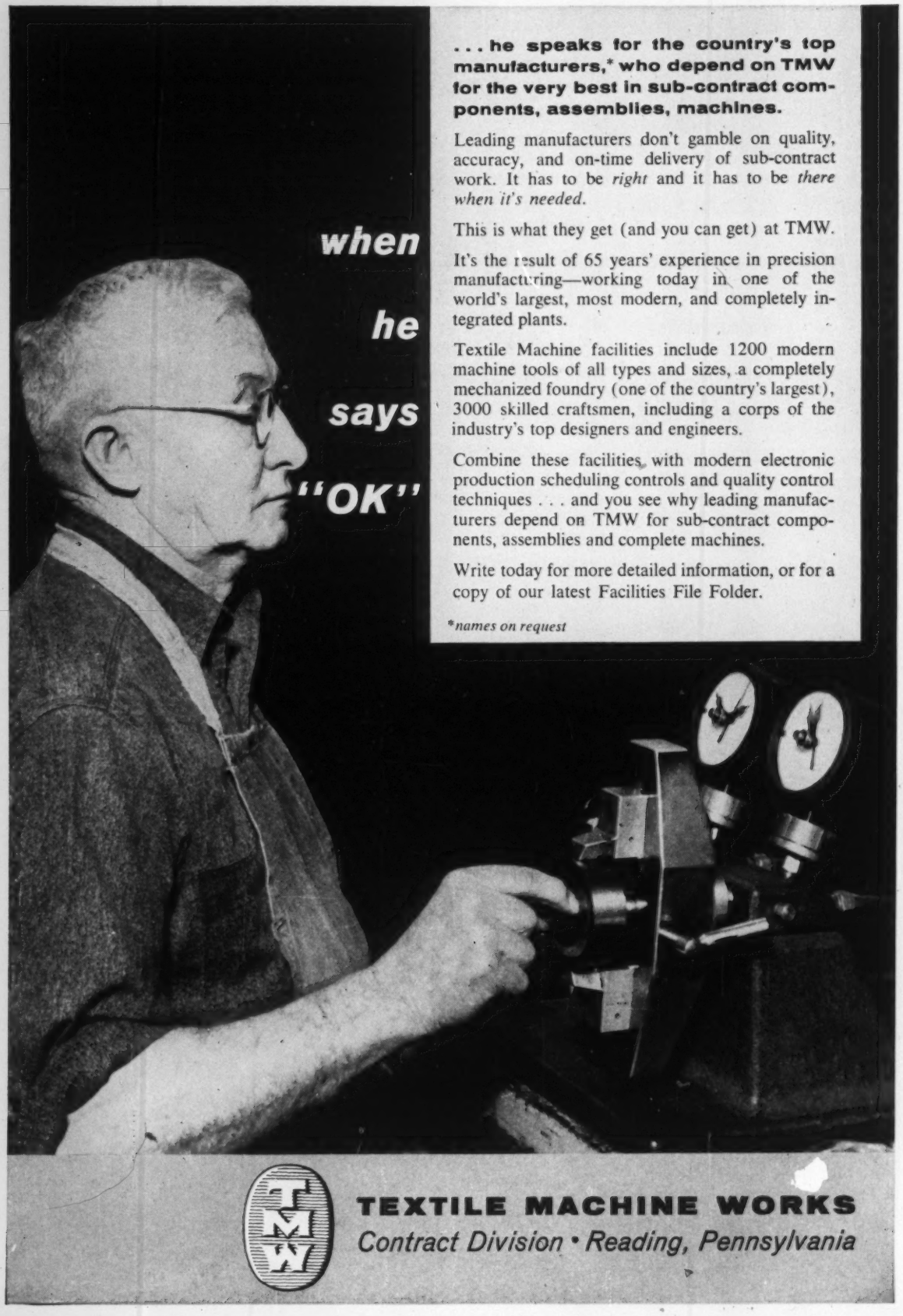
Steel-strapped Wooden Racks

Shaped Coils (1500-2500 lbs. capacity)

Stem-paks® (500-1000 lbs. capacity)

Returnable Spiders (2000-3000 lbs. capacity)

Steel-strapped Coils (200-2000 lbs. capacity)



. . . he speaks for the country's top manufacturers,* who depend on TMW for the very best in sub-contract components, assemblies, machines.

Leading manufacturers don't gamble on quality, accuracy, and on-time delivery of sub-contract work. It has to be *right* and it has to be *there when it's needed.*

This is what they get (and you can get) at TMW.

It's the result of 65 years' experience in precision manufacturing—working today in one of the world's largest, most modern, and completely integrated plants.

Textile Machine facilities include 1200 modern machine tools of all types and sizes, a completely mechanized foundry (one of the country's largest), 3000 skilled craftsmen, including a corps of the industry's top designers and engineers.

Combine these facilities with modern electronic production scheduling controls and quality control techniques . . . and you see why leading manufacturers depend on TMW for sub-contract components, assemblies and complete machines.

Write today for more detailed information, or for a copy of our latest Facilities File Folder.

**names on request*

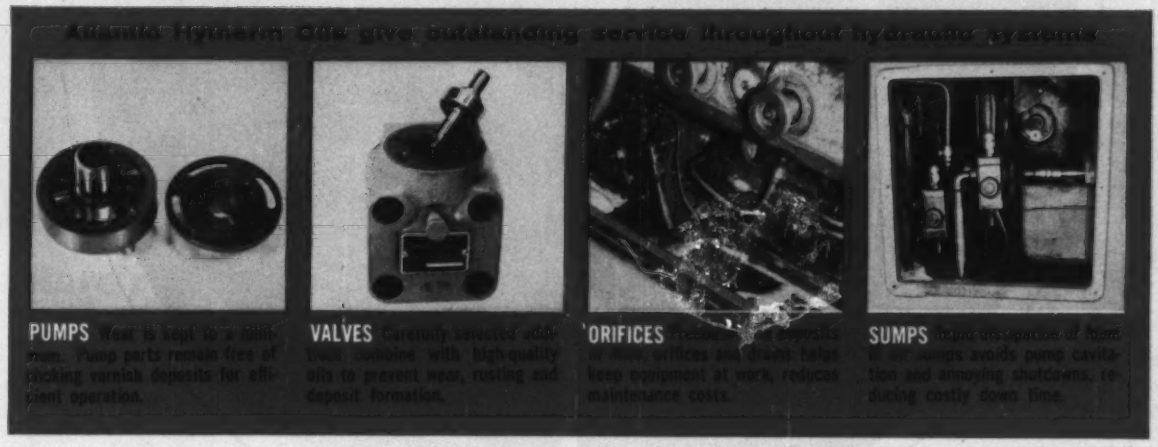
TEXTILE MACHINE WORKS

Contract Division • Reading, Pennsylvania

Keep your equipment upkeep down with . . .

ATLANTIC HYTHERM OILS

Economical, turbine-quality lubricants with all properties recommended by hydraulic equipment builders



The type of fluid power transmission medium used in a hydraulic system is largely responsible for its economical and effective operation. Realizing the importance of oil stability to successful service, manufacturers of hydraulic equipment long have recommended oils having the same properties found in turbine lubricants which must operate continuously for long periods of time.

Atlantic Hytherm Oils are basically turbine quality products. They are produced from solvent treated paraffin base stocks which have a high viscosity index. In addition, they are fortified with additives to resist oxidation and foaming as well as to protect machine parts against rust.

The most outstanding feature of Hytherm oils is their anti-wear characteristic . . . a direct result of this unique additive combination. Compared in performance under identical conditions, with high-quality straight mineral oils of comparable viscosity, Atlantic Hytherm Oils actually cut wear-rate of vane type pump parts 100 times. Savings in maintenance costs and equipment down time far exceed the moderate increase in cost of the Hytherm oils above ordinary mineral oils.

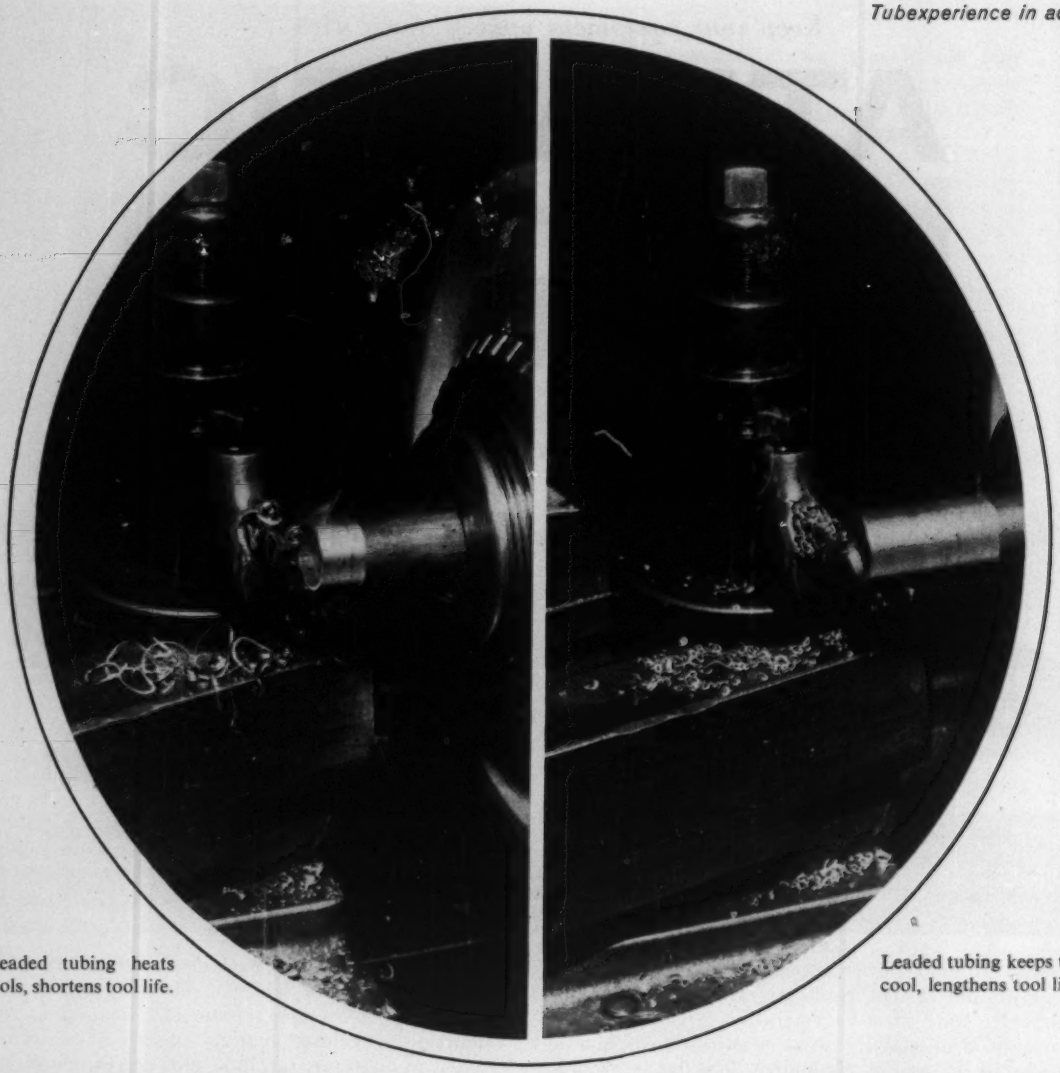
And Atlantic Hytherm Oils also provide excellent versatility. In fact, they've been used successfully in a variety of "hot-oil" heat exchange systems with a minimum of undesirable deposits. They are highly recommended for lubricating compressor cylinders, rotary compressors, enclosed gear and chain drives, dryer roll circulating systems, machine tool drives, small steam turbines and other applications where over-all stability is highly necessary.

Your Atlantic Sales Engineer will welcome the opportunity to discuss the application of these oils to your specific requirements. In cases where detailed analysis is required, the facilities of the Product Development & Technical Services Division are at your disposal, entirely without obligation. Simply call or write to The Atlantic Refining Company, Pennypacker 5-2345, 260 S. Broad Street, Philadelphia 1, Pa.

ATLANTIC

CHOOSE FROM OUR FULL RANGE OF HIGH-QUALITY OILS TO MEET YOUR LUBRICATION NEEDS

Providence, R. I., 430 Hospital Trust Bldg. • Syracuse, N. Y., Salina and Genesee Sts. • Reading, Pa., First and Penn Aves. Pittsburgh, Pa., Chamber of Commerce Bldg. • Charlotte, N. C., 1112 South Boulevard



Nonleaded tubing heats up tools, shortens tool life.

Leaded tubing keeps tools cool, lengthens tool life.

Now Superior Carbon Steel Tubing with Built-in Lubrication

New leaded 1020 tubing permits faster speeds and heavier feeds, often reduces the number of finishing operations

Where machinability is of major importance, specify Superior Seamless Leaded 1020 Tubing. Its built-in lubrication permits faster speeds in turning, drilling, tapping, milling, grinding and other machining operations, provides an 18% increase in feeds, and often reduces the number of finishing operations required to produce a smooth, lustrous surface. Build-up of metal at the cutting edge of the tool is minimized. Chip formation is improved. Tools operate at lower temperatures, last longer, and require fewer dressings. Lower tool cost is an accompanying benefit. Another is reduced downtime for replacement of dull and wornout tools. There is virtually no difference in physical and mechanical properties between leaded and nonleaded carbon steel tubing. So the grades are interchangeable.

Superior Seamless Leaded 1020 Tubing is available in a range of ODs from .012 through 1⅛ in. For particulars, send for Data Memorandum No. 24. And remember that other small-diameter tubing is available in more than 120 analyses, meeting a very broad range of applications. Superior Tube Company, 2005 Germantown Ave., Norristown, Pa.

Superior Tube

The big name in small tubing

NORRISTOWN, PA.

All analyses .010 in. to ⅝ in. OD—certain analyses in light walls up to 2½ in. OD

West Coast: Pacific Tube Company, Los Angeles, California • FIRST STEEL TUBE MILL IN THE WEST

Here's proof of economy with FALK Shaft Mounted Drives

PROBLEM—For many years, a prominent Eastern abrasives manufacturer* experienced high maintenance and down-time costs, as well as excessive noise and vibration, in the operation of 19 pebble mills driven by open spur gears. Drive gears and jack shaft pillow blocks required frequent repairs or replacement, and trunnion shafts often failed, due to radial overloading of the bull gear when broken pinion teeth bottomed between gear teeth.

SOLUTION—After numerous unsuccessful approaches to these problems, the solution was found by mounting a Size 315J FALK Shaft Mounted Drive directly on the mill drive trunnion. This eliminated objectionable gear noise and vibration...greatly reduced costly down-time and loss of production...and cut annual maintenance and replacement expenses as indicated by the following figures taken from the customer's records:

Spur Gear-and-Pinion Drive		FALK Shaft Mounted Drive	
Bull Gears	$ 56	VEE Belts	$ 30
Pinions	120	FALK Shaft Mounted Drive (based on 10-year life)	70
Pillow Blocks	90		
VEE Belts	30		
Trunnion (5-year life)	100		
Annual cost	$396	Annual cost	$100
		ANNUAL SAVINGS	$296

IF OBSOLETE DRIVES ARE COSTING YOU MONEY, a change to Falk All-Steel Shaft Mounted Drives can effect important savings in money and production. Used on almost any type of machine, these compact, rugged units are establishing new standards of economy and efficiency in many industries. Specify FALK Drives on your purchased equipment...For full details, **write for Bulletin 7100.**

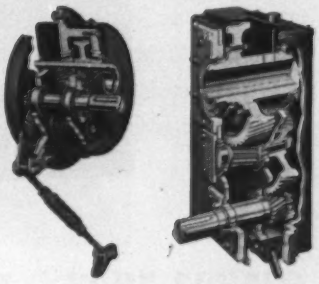
*Name on request

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in Most Principal Cities

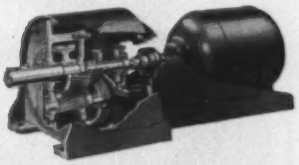
To get the right drive for your application, specify FALK®



SHAFT MOUNTED DRIVES

Horizontal or vertical units—½ to 50 hp—420 to 5 rpm—single and two double reduction ratios—output torque ratings up to 41,000 lb-in (consult factory for higher torque capacity).

• • •



ALL-MOTOR® MOTOREDUCERS

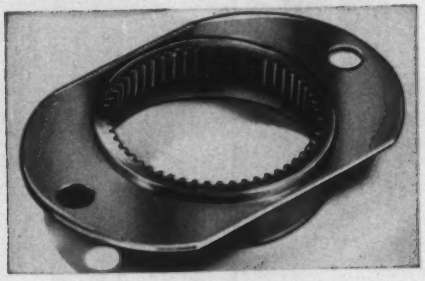
Sizes up to 75 hp—furnished with or without standard foot-mounted motor—standard output speeds 1.2 to 520 rpm (with 1750 rpm motors) —ratios as high as 54,000:1 in semi-standard designs. Integral units (gearmotor type) also available. Ask for **Bulletin 3100.**

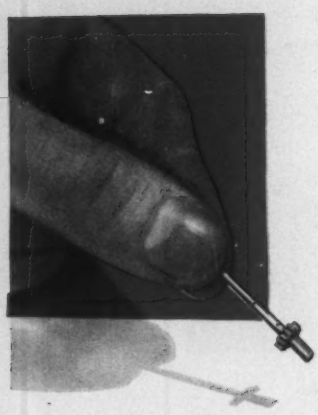
• • •

FALK Drives are available from factory and distributor stocks from coast to coast. Consult your Falk Representative or Distributor.

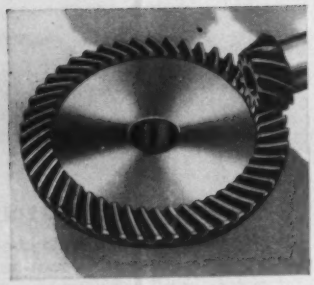
FALK

...a good name in industry





if precision is your problem . .



SPECTACULAR UNIFORMITY, EVEN ON HIGH-PRECISION SPECS—THAT'S THE HALLMARK OF A G.S. RUN

Being precise, almost to perfection, on a single piece or even two or three isn't much of a challenge to any competent shop. Being precise in terms of holding to really close tolerances on hundreds of thousands of pieces on a production run is something else again. Yet that's the kind of performance on which G.S. has built an unsurpassed reputation.

We set G.S. standards high to begin with: and we back them up with one of the finest plants of its kind in the country—with the most efficient machinery to be had—with first-class engineering in both design and production—with quality control systems and equipment which aim at perfection. Because every man in our plant knows that our standards brook no compromise, we've more than once had to reject only five or six finished Gears out of a production run of thousands.

If you value precision results on a production basis, in Worm Gearing, Bevels, Helicals, Ratchets, Zerols, Spirals, Clusters, Internals, Splines, Pinions or any other Gearing of special or standard design in sizes from 8 to 120 dp, from ⅛" to 8" diameter, G.S. belongs on *your* supplier team. Our engineers are at your service to discuss development of new projects, or better means to accomplish old ones.

Call or write us today!

..with production-quantity Small Gearing...your source should be...

YOU'LL FIND G.S. GEARING IN TOP QUALITY PRODUCTS LIKE THESE . . .

Adding Machines • Aircraft Carburetors & Fuel Metering Systems • Aircraft Instruments and Radios • Automatic Musical Instruments • Automation Systems • Business Machines • Check Signing & Protecting Machines • Clippers for Barbers, Animal Shearing & Hedge Trimming • Cloth Cutting Machines • Coin Changers & Counters • Communication Equipment • Control Mechanisms • Electric Fans • Electric Motors • Floor Polishers, Sanders, Scrubbers, Sweepers • Food & Drink Mixers, Blenders • Home Appliances • Lawn Sprinklers • Machine Tools • Meat Tenderizers, Grinders, Slicers • Military Equipment • Motion Picture Cameras & Projectors • Optical Instruments • Outboard Motors • Pneumatic Production Tools • Radio & Radar Tuning Assemblies • Radio Anti-backlash Gears • Range Finders • Record Changers • Sewing Machines • Steel Strap Stretchers • Step Switches • Tapping, Drilling & Threading Equipment • Telephone Dials • Television Sets • Thermostatic Controls • Typewriters • Vending Machines • Washing Machines.

•

SEND FOR G.S. *illustrated folder! See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant view, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!*

FRACTIONAL HORSEPOWER GEARING

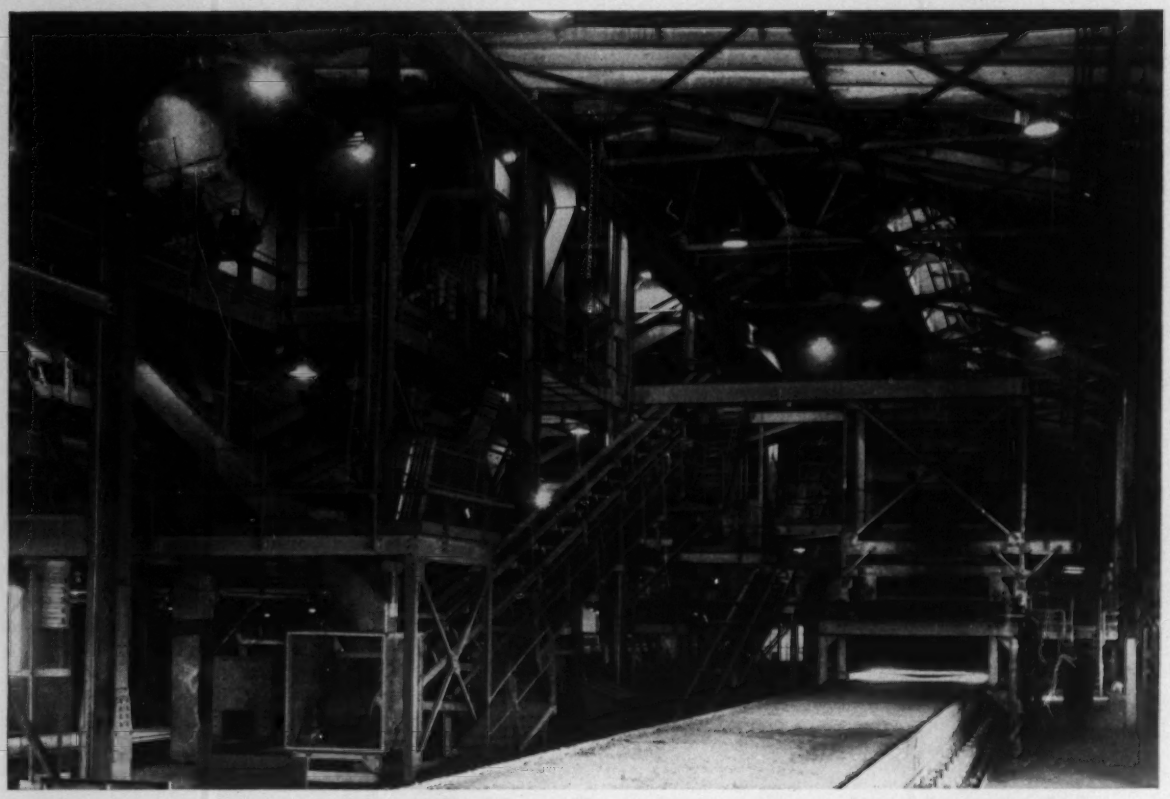
GEAR Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

43 Years of Specializing in Small Gearing!



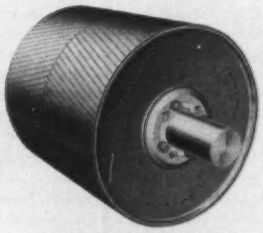
Sinter Plant Conveyor System at exciting new Jones & Laughlin Cleveland Works equipped with Dodge Products for dependability

The conveyor system of this modern sinter plant, engineered and erected by Arthur G. McKee & Company, is equipped with Dodge Taper-Lock Steel Conveyor Pulleys and Dodge Type C Pillow Blocks with Timken Tapered-Roller Bearings.

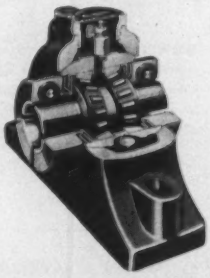
Maximum strength with minimum weight is a feature of these conveyor pulleys. Steel rims, discs and hubs are fused together into jointless drum construction for terrific impact resistance. With the unsurpassed holding power of Taper-Lock mounting there is no "walking on the shaft."

Dodge Type C Pillow Blocks with Timken Tapered Roller Bearings were chosen for their extraordinary ruggedness. They have *high* radial and thrust capacities, they are fully self-aligning, triple sealed against the most severe conditions of dust and other contamination and they are adjusted, lubricated and sealed at the factory for a long life of dependable service.

DODGE MANUFACTURING CORPORATION, 4400 Union St., Mishawaka, Ind.



DODGE TAPER-LOCK STEEL CONVEYOR PULLEYS



DODGE TYPE C PILLOW BLOCKS WITH TIMKEN BEARINGS

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

another idea roller die, cold formed

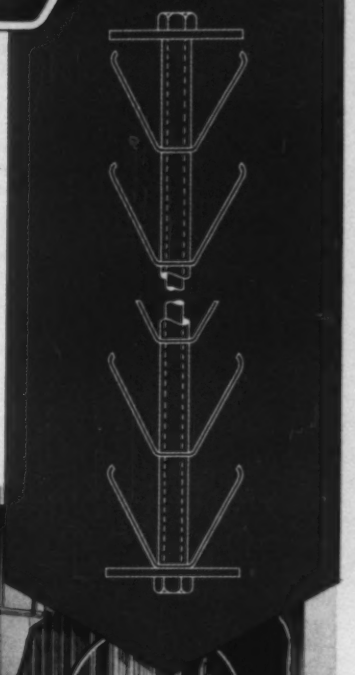
by **VAN HUFFEL**

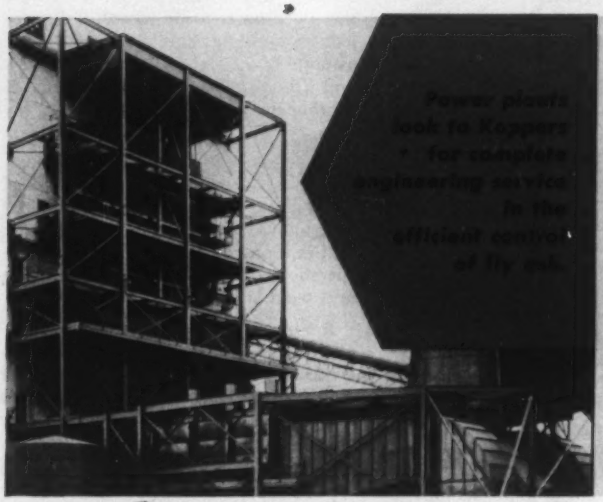
FOR KOPPERS **ELECTROSTATIC PRECIPITATORS**

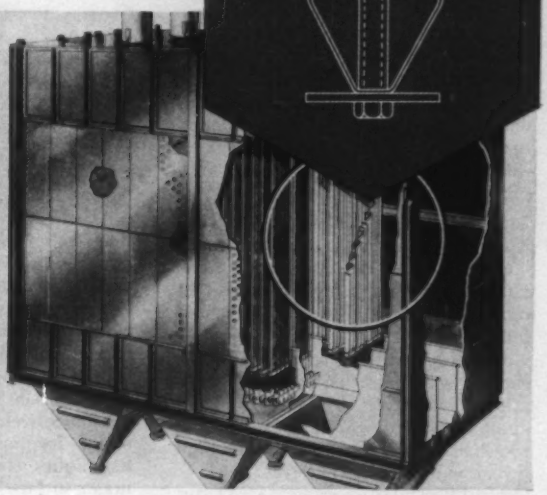
This V-Pocket Electrode section, produced for Koppers Electrostatic Precipitators, is another of the many ideas Van Huffel roller die, cold forms in various metals for a wide variety of applications.

Whether you require a simple or complex shape—in hot or cold rolled steel, stainless steel, high strength steel, coated steel, aluminum, copper, painted or plated metals—for parts in such widely diverse fields as material handling, building construction, communications, transportation, farm implements, furniture and appliances—it's probable Van Huffel's experience, facilities and products can help you cut costs and make a better product. The handbook shown below tells you how.

Where ideas *take shape*







MAIL COUPON FOR FREE METAL SHAPES HANDBOOK . . .

48 fact filled pages on material selection, fabrication methods, tolerances and dozens of illustrated ideas that have taken shape in metal.

Name .....Title .....

Company .....

Address .....

City.....Zone ....State .....

VAN HUFFEL TUBE CORPORATION . . WARREN, OHIO

CLAD REX ®C

How to assemble piece parts made of CLAD-REX®

Piece parts made of Clad-Rex vinyl-metal laminates can be assembled much like any *un*finished sheet metal parts. No costly retooling or complicated, special techniques are required. However, the few limitations that do exist should be considered with initial planning.

Mechanical Fastening

Mechanical fasteners are as practical with Clad-Rex piece parts as with *un*finished sheet metal parts. The same considerations apply for selection of fastener type and production method. However, piercing or blanking is most suitable from the vinyl side of the laminate. Where both sides of the piece part are vinyl laminated, the thicker vinyl should be exposed to the cutting tool.

Mechanical interlocking by bending, crimping, or any standard lock seam technique is practical.

The resilient vinyl surface of Clad-Rex offers unusual opportunity for fastening with extruded metal devices. Decorative appeal and functional needs can be combined with simple assembly procedures. Extruded teeth within the gripping channels will satisfy most structural requirements. Where extra joint strength is required, dimpling is usually sufficient.

Adhesive Bonding

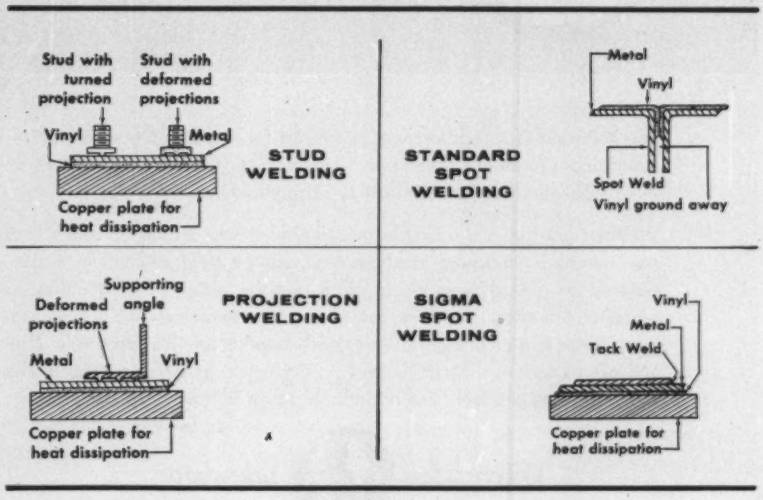
The heat limitation of vinyl-metal laminates must be considered here. Particularly when using adhesives that require heat (or heat and pressure) for curing.

Clad-Rex with an embossed vinyl surface will withstand temperatures approaching 250° F without loss of embossed texture. Where pressure is required in addition to heat, the limit goes down proportionately.

Clad-Rex with a smooth vinyl surface will accept approximately 30% higher heat.

Such other adhesives as the contact or mastic types present no special problems. When using adhesives that require time for curing, clamps can often be eliminated by using interlocking design or resistance weld tacking.

Generally, vinyl-metal laminates in the flat are more tolerant to heat than formed or deep drawn shapes. However, because of the many variables, each bonding application should be considered on an individual basis.



Welding

The heat limitation of vinyl-metal laminates makes some forms of welding impractical. Particularly where the weld area is an exposed finish surface. Only those welding methods that sharply localize and limit the spread of heat are successful. Fusion welding is limited to sigma spot or similar types.

The heat factors combine with the electrical resistance of vinyl to limit resistance welding procedures. Resistance type stud welding is practical. Conventional spot welding is practical where the vinyl surface can be removed with wire brushing or stripping. Where the weld area is opposite a vinyl surface that will be exposed, resistance welding equipment must be tooled for indirect series or parallel techniques (both electrodes on metal under-surface). If the joint has only a minimum of structural requirement, spot welding can be used.

However, where greater structural requirements do exist, only projection welding techniques are suitable. Because all projections must "set down" at once, this limits the size of one of the piece parts to be joined. The projection welding equipment must be capable of (1) very short weld times and (2) extremely fast follow-up of forging pressure.

Generally, there are many variables in resistance welding. Each application must be considered individually. As in all resistance welding, individual imagination in the use of technique and equipment is limited only by the specific requirements of surface finish and weld strength.

A Source of Engineering Service

Clad-Rex interest in helping you extends into your own plant. A Clad-Rex Fabricating Engineer is provided to show your production people how easy it is to process Clad-Rex. Furthermore, Clad-Rex operates a fully staffed and equipped research laboratory. Its facilities are devoted to customer service as well as improving Clad-Rex products.

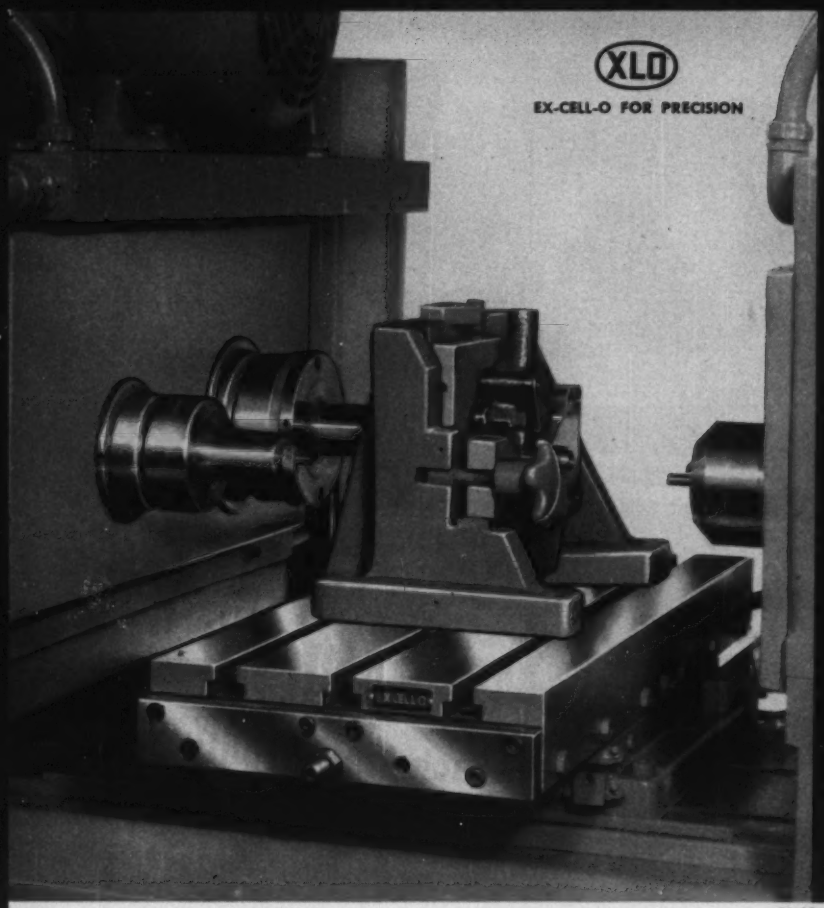
Write and describe your product. See how Clad-Rex can work its broad effect on your manufacturing methods and costs. No obligation, of course.

VINYL-METAL LAMINATES BY **CLAD-REX** DIVISION OF SIMONIZ COMPANY

2105 Indiana Avenue • Chicago 16, Illinois

Telephone: VIctory 2-7272

Add production flexibility the low-cost way, with EX-CELL-O UNIVERSAL FIXTURES

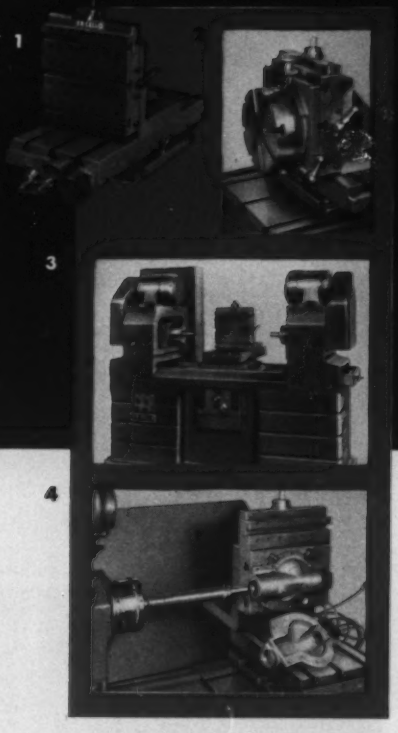


59-19

- Faster parts changeover
- Easier work setups
- More work from your present machines

LEFT
Hydraulically-operated cross slide of Universal Fixture supports angle plate fixture for production boring and facing.

BELOW
1 Manually-operated unit equipped with vertical slide. 2 Rotary Index Table mounts on Universal Fixture, has vernier scale for precise angular settings. 3 Installed on Style 17-A Precision Boring Machine, Hydraulic Universal Fixture increases versatility at low cost. 4 Adaptable to many operations, this Universal Fixture permits fast setup for line-boring and finish-facing work.



There's no end to the variety of boring, turning and facing jobs your Ex-Cell-O Precision Boring Machines can do when fitted with Universal Fixtures!

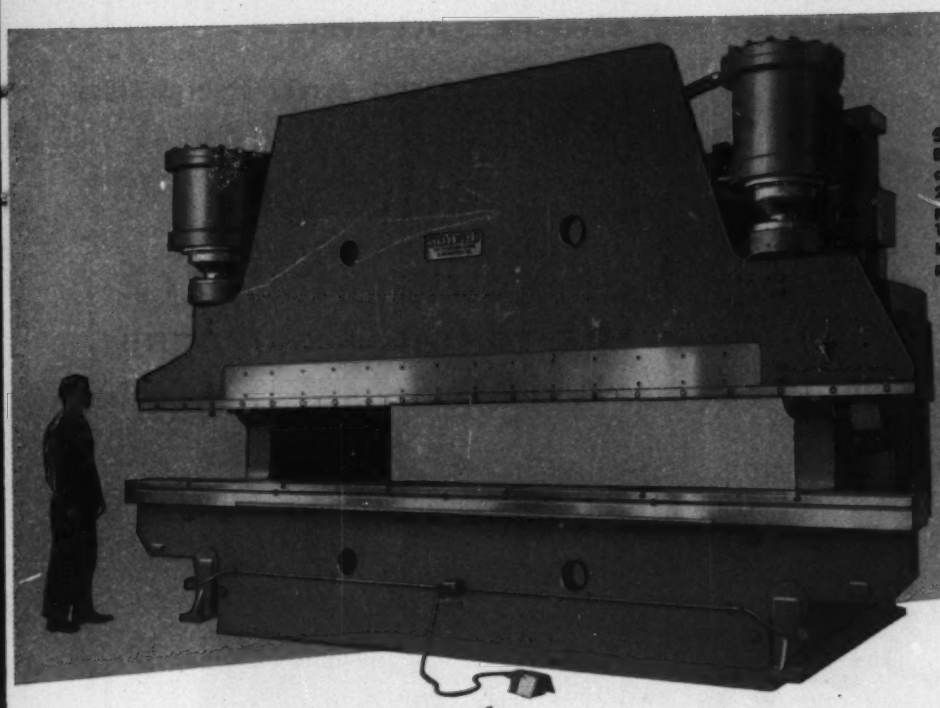
Designed for both short-run work and volume production, Ex-Cell-O Universal Fixtures come to you ready to mount on the machine table. Base, bracket and slides are normalized nickel-iron castings, with precision-machined T-slots and tapped holes for quick setup and accurate alignment of spindle to fixture. Work, fixtures or tools can be mounted at any position on the vertical or horizontal slide; inbuilt micrometer adjustment assures accurate setups.

Available for either manual or hydraulic operation, Universal Fixtures fit small and large Ex-Cell-O Precision Boring Machines, single or double-end models. Write today for details, or contact your Ex-Cell-O Representative.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

STEELWELD
Large numbers of Steelweld Mechanical Press Brakes are in operation in the United States and throughout the world. This machine is rated for 6' x ¼", but has 12'-0" bed and ram. Sizes available to 2000 tons for forming lengths to 30 feet.
STEELWELD Mechanical Press Brakes
Catalog No. 2023
STEELWELD
MECHANICAL and
Each Line Quality Built
The smooth operation of Steelweld Mechanical Shears with exclusive pivoted-blade has proven a tremendous advantage to a great list of users. This shear is rated 10'-0" x ¼". Others available for plate to 30 ft. and thicknesses to 2 inches.
STEELWELD
STEELWELD Mechanical Pivoted-Blade Shears
Catalog No. 2011
For Nearly 30 Years STEELWELD Has Been a Leading Name in Metalworking Machinery.
These FREE catalogs give you complete details.
Write or phone for catalogs desired, and we will rush them to you.



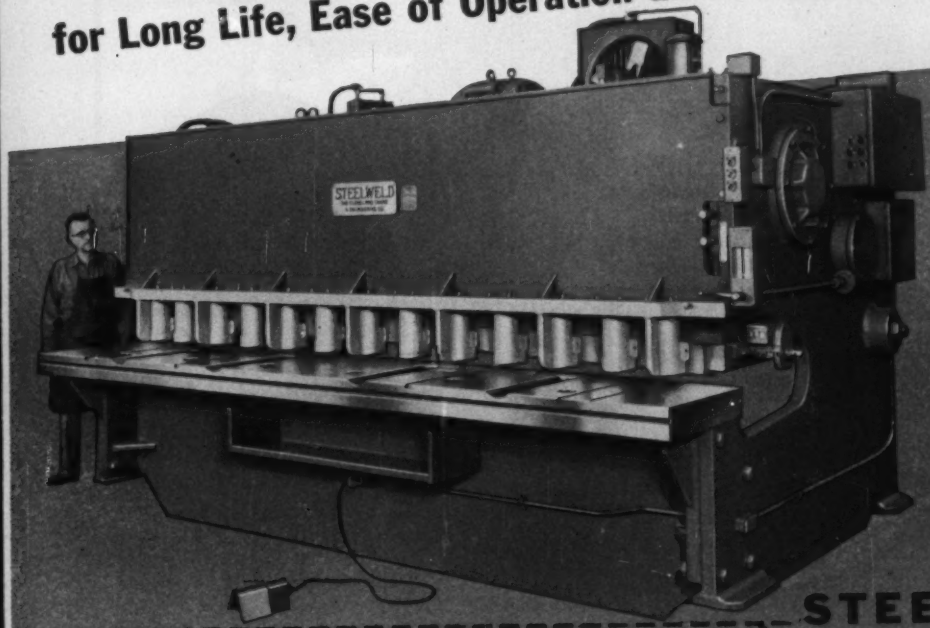
Steelweld Hydraulic Press Brakes are available in capacities from 200 to 2000 tons for working plate in lengths to 30 feet. The picture is of a 500 ton brake that will form steel plate up to 20' x 5/8".

STEELWELD Hydraulic Press Brakes
Catalog No. 2024

Offers Complete Lines of

HYDRAULIC PRESS BRAKES and SHEARS

for Long Life, Ease of Operation and Finest Performance



Steelweld Hydraulic Shears have two remarkable features not available on any competitive machine: Single-cylinder drive and pivoted-blade cutting action. The shear shown here handles plate to 12' x ½". Other sizes go to 30 feet and for plate thicknesses to 2 inches.

STEELWELD Hydraulic Pivoted-Blade Shears
Catalog No. 2030

STEELWELD
Mechanical and Hydraulic BRAKES and SHEARS

STEELWELD Machinery also includes One-, Two- and Four-Point Straight-Side Presses and Spaced-Draw Presses.

STEELWELD MACHINERY DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7878 EAST 281st STREET, WICKLIFFE, OHIO

RIGHT... in every shape and size

for fast action and long life

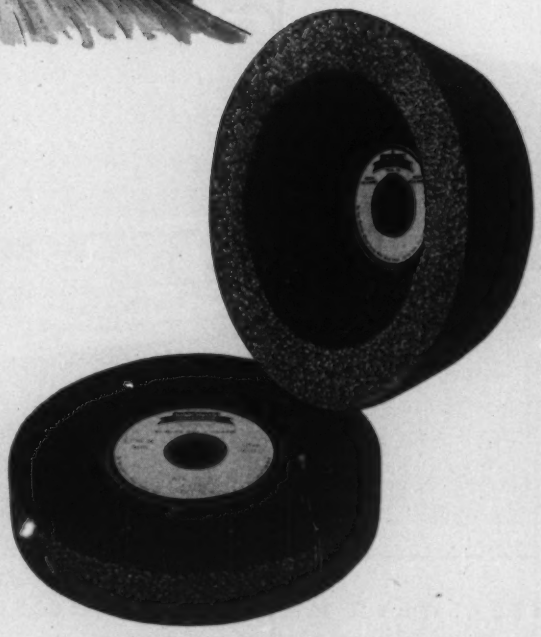
SIMONDS SNAGGING WHEELS

FOR PORTABLE GRINDERS

Right for you . . . for rapid metal removal and long wheel life. With Simonds snagging wheels, that is *consistently* true, from order to order. They're made for all portable grinders . . . air, electric or flexible shaft . . . straight wheels, cup wheels, cones and depressed center wheels. Resinoid bonded for high speeds up to 9,500 s.f.p.m. Vitrified bonded for regular or low speeds up to 6,500 s.f.p.m.

Improved resinoid bond contains an internal lubricant consisting of special chemicals and compounds added to the wheel mix for improved grinding action.

Write for Bulletin ESA-304



SIMONDS ABRASIVE CO.

PHILADELPHIA 37, PENNA.

Division of Simonds Saw and Steel Co.

COUNT ON / YOUR SIMONDS DISTRIBUTOR / FAST SERVICE • LOCAL STOCKS

WEST COAST PLANT: EL MONTE, CALIF.—BRANCHES: CHICAGO • DETROIT • LOS ANGELES • PHILADELPHIA • PORTLAND, ORE. • SAN FRANCISCO SHREVEPORT—IN CANADA: GRINDING WHEELS DIVISION, SIMONDS CANADA SAW CO., LTD., BROCKVILLE, ONTARIO • ABRASIVE PLANT, ARVIDA, QUEBEC

GAYLORD TRIMS
YOUR PACKAGING COSTS

Gaylord's approach to packaging doesn't stop with the corrugated box itself. We take a fresh look at your entire packing and handling cost picture, then tailor a program to your exact measure.

Regular cartons in big volume . . . engineered packaging . . .
your nearby Gaylord man knows both. And he is cost-conscious either way.

CROWN ZELLERBACH CORPORATION
GAYLORD CONTAINER DIVISION

IN CANADA • CROWN ZELLERBACH CANADA, LTD. VANCOUVER, B.C.

HEADQUARTERS, ST. LOUIS
PLANTS COAST TO COAST

NEW GARDNER-DENVER TRU-THREAD TAPPERS

Tru-Thread Tapper with mounting bracket for stationary applications.

Tru-Thread Tapper with nosepiece for portable applications.

...CUT COSTS IN PRODUCTION TAPPING

TIME TO TALK COST SAVING

When you keep in touch with your Gardner-Denver air tool specialist, you keep in touch with the latest developments in new methods and machines to cut production costs. This is the foundation of our 100-year philosophy of growth—at Gardner-Denver there's no substitute for men.

Quality performance

Now precision tapping of clean, accurate threads is quick, easy and economical with new Gardner-Denver air-powered, positive-feed Tru-Thread (T.M.) Tappers. "Controlled-pitch" lead screw feed prevents tearing or stripping of threads and tap breakage. With Gardner-Denver "controlled pitch," Model 93B Series tappers consistently produce threads of Class 3 fit quality. Single control starts completely automatic cycle.

Portable or stationary mounting

Mount the Tru-Thread Tapper on a simple jig or automatic machine and get low-cost, *precision* thread cutting. Keep your machine tools efficiently occupied with other work.

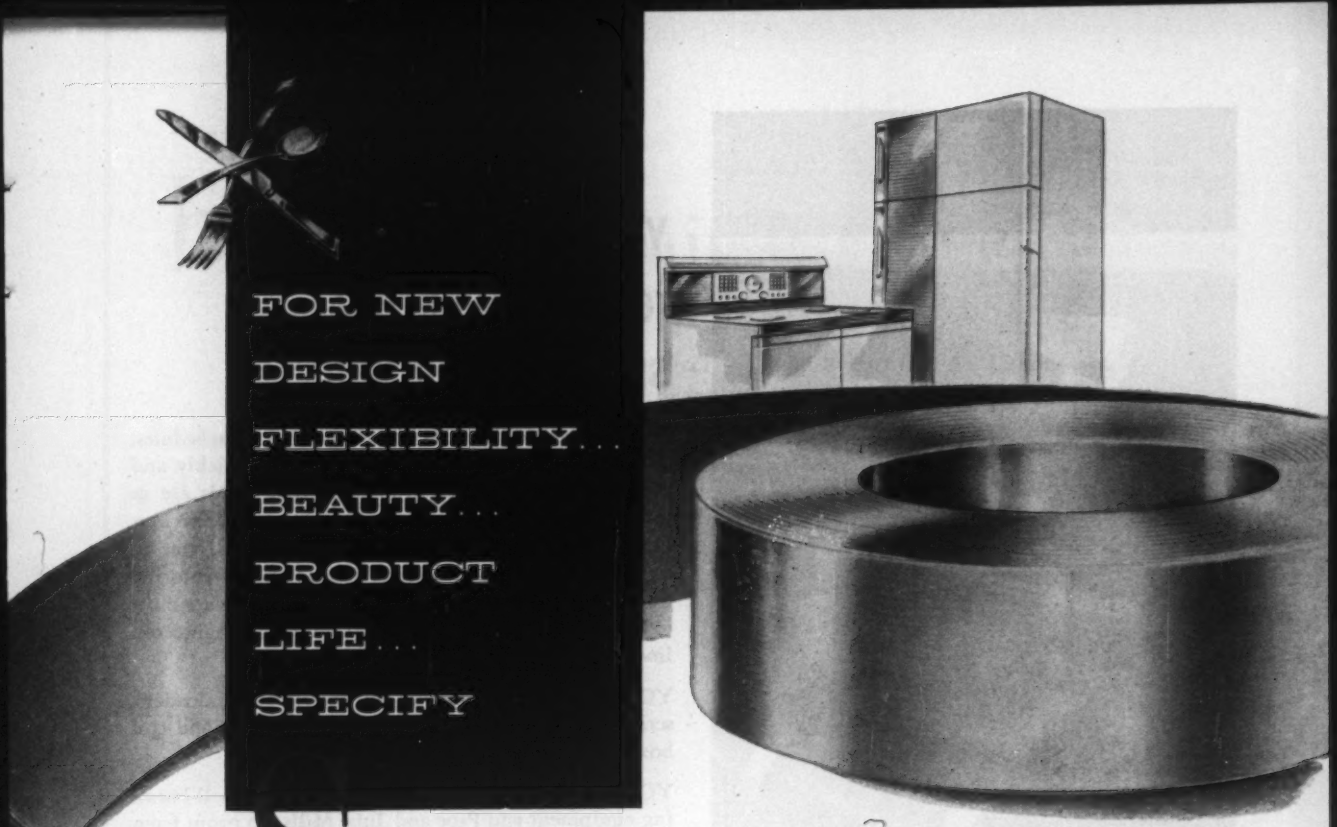
For portable applications, simply add a nosepiece for use with self-locking drill bushing tip. One man can easily take the tool to the work . . . from job to job.

Designed specifically for production thread cutting, the Tru-Thread Tapper is the ideal solution to all tapping problems in hole sizes from No. 2 to 1" diameter. Ask a Gardner-Denver special machines engineer how this versatile air tool can be incorporated into a fully-automated unit. For complete details, request Bulletin 93-31.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario



FOR NEW
DESIGN
FLEXIBILITY...
BEAUTY...
PRODUCT
LIFE...
SPECIFY

Sharon stainless

Sharon Stainless Steels excel in the things you need to make your appliance more attractive... more durable. Tolerance, drawing ability, dense smooth finish, you name it ... Sharon stainless includes the best combination ... manufactured to your exact need.

Consider too, Sharonart*, Sharon's exciting new rolled-in surface patterned steel—opening a new breadth of design flexibility for the appliance designer. Sharonart* made of stainless steel will reflect an infinite variety of color and texture combinations. Many beautiful patterns available.

For the stainless you need to make your product even better—get in touch with your Sharon representative —or write us direct. *Sharon Steel Corporation, Sharon, Pa.*

* T.M.

SHARONSTEEL **SHARON** *Quality* **STEEL**

Yoder Rotary Slitters reduce inventory... speed production

To help meet the demands of tight production schedules, YODER Slitters reduce mill-width stock quickly and economically to desired widths. If your needs are as low as 100 tons per month, time and manpower savings alone will offset the cost of your YODER Slitter in a matter of months, while reducing basic inventories. Compactly designed, standard YODER Slitters are built to handle standard coil widths...completely engineered lines for special requirements.

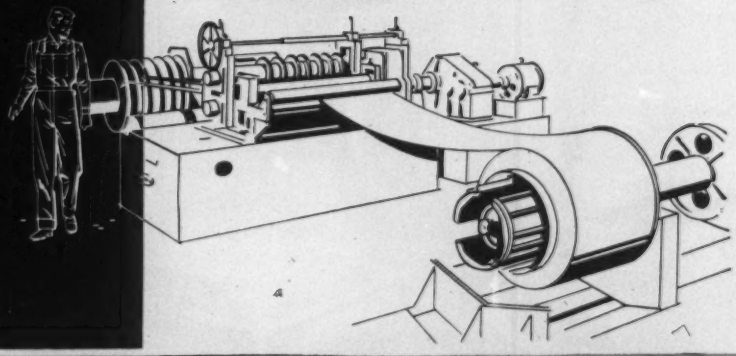
YODER accessories, such as coil cars, swivel unloaders, scrap choppers, scrap disposers, plate levelers and coil boxes, make stock handling fast and easy.

YODER also makes a complete line of Cold Roll-Forming equipment and Pipe and Tube Mills. To profit from YODER'S years of engineering and service experience, contact your local YODER representative or send for the YODER Slitter Manual.

THE YODER COMPANY

5502 Walworth Avenue • • Cleveland 1, Ohio

Investigate the many advantages of YODER-engineered Slitter Installations. Write today for this comprehensive, 80 page YODER Slitter Manual ...it's yours for the asking!



ENGINEERING **YODER** MANUFACTURING

ROTARY SLITTING LINES

PIPE AND TUBE MILLS (ferrous or non-ferrous)

COLD ROLL FORMING MACHINES

beauty is stainless steel

Look for the beauty of Stainless Steel on your new automobile. Its bright finish will make your car look better, stay in style longer and have a higher trade-in value.

No other metal offers the freedom of design and fabrication, economy of care and the durable beauty that serves and sells like Stainless Steel.

McLOUTH STEEL CORPORATION, Detroit 17, Michigan

specify

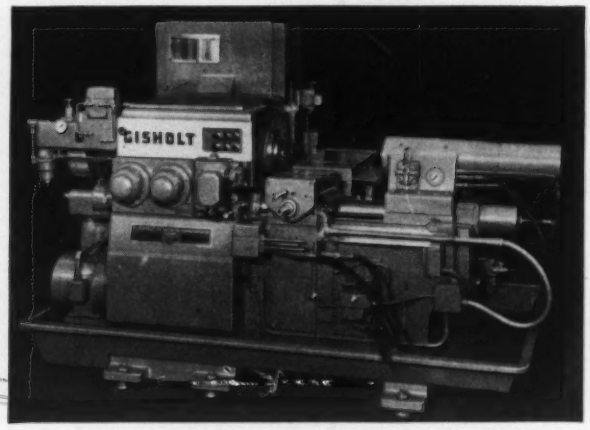
McLOUTH STAINLESS STEEL

HIGH QUALITY SHEET AND STRIP

for automobiles

WHICH IS MOST IMPORTANT TO YOU?

Power
Speed
Versatility
Capacity
Quick Setup?



Gisholt No. 12 Automatic Chucking Lathe

You don't have to sacrifice one advantage for another because here is an ideal combination of all in the industry's most modern high-production automatic chucking lathe.

This Gisholt No. 12 is quickly set up to save you time and money on continuous, high-speed production or a wide variety of parts in small lots. It can take practically any part up to 16½" in diameter.

COST-CUTTING VERSATILITY. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it gives you top efficiency in all phases of every job—cutting costs all the way.

INCREASES OPERATOR PRODUCTIVITY. Each machining step is handled in rapid automatic sequence—freeing your operator to handle additional machines.

GREATER POWER, GREATER ACCURACY. Constant h.p. motor (up to 40 h.p.) on the No. 12 takes full advantage of today's most advanced cutting tools and tooling techniques. Greater weight and rigidity allow heaviest cuts at punishing speeds without vibration.

COMPLETE RANGE OF ACCESSORIES. Front, rear, auxiliary and overhead slides can be used; angular cuts are easily made; JETracers can be used with greatest efficiency. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

Your Gisholt Representative will gladly show you how the No. 12 Automatic Chucking Lathe will pay for itself in your plant. Call him, or write for Bulletin 1213.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines • *Factory-Rebuilt Machines with New Machine Guarantee*

Who Buys Roebling Upholstery Spring Wire After You Do?

The end-user can hardly be expected to know a great deal about Roebling helical spring wire, border and brace wire, zigzag and no-sag wire, wire for automatic machines, lacing wire . . .

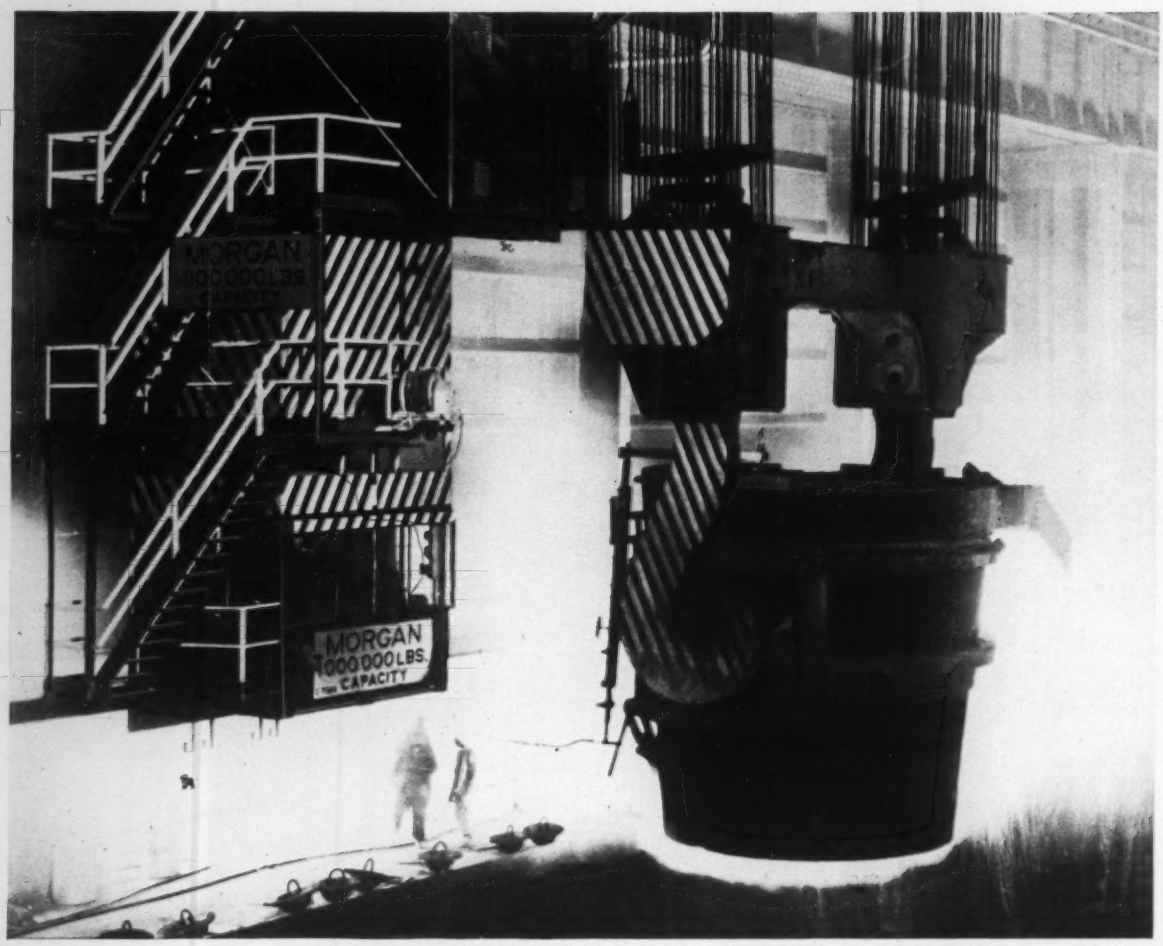
Thus, the qualities of uniformity, temper, tensile strength, size and finish that are yours whenever you use Roebling Spring Wire mean long life, resiliency under constant use (and abuse) where it counts the most . . . to those who buy Roebling Upholstery Spring Wire after you do.

For further information on the wide range of types, the consistent superiority and availability of these and other Roebling wire products, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

Roebling...Your Product is better for it

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation



Repeated million-pound loads in the intense heat from 375 tons of molten steel, cause no spalling or deformation of Rollway Bearings.

1,122,000 Pounds Ride on 68 Rollway Bearings

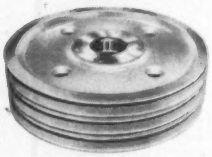
One of the largest in the world, this 500-ton Morgan-built ladle crane is Rollway equipped in many positions.

Sixty-eight maximum-type, solid-cylindrical bearings—mounted without inner races—lift and lower the 1,122,000-pound weight of the lifting beam, ladle hooks, ladle and white-hot steel.

Rollway Tru-Rol® type bearings are used in the two General Electric 360 HP – MD-620 Hoist motors which lift the weight of the ladle and its molten metal content.

The maximum-type bearings in the hoisting sheaves are mounted directly on the shaft without inner races, which greatly simplifies assembly for applications of this size.

Thrust bearings in the 25-ton and 75-ton auxiliary crane hooks are standard Rollway precision types with broad-area contact between rollers and plates to prevent Brinelling and assure freedom of rotation under the heaviest loads.

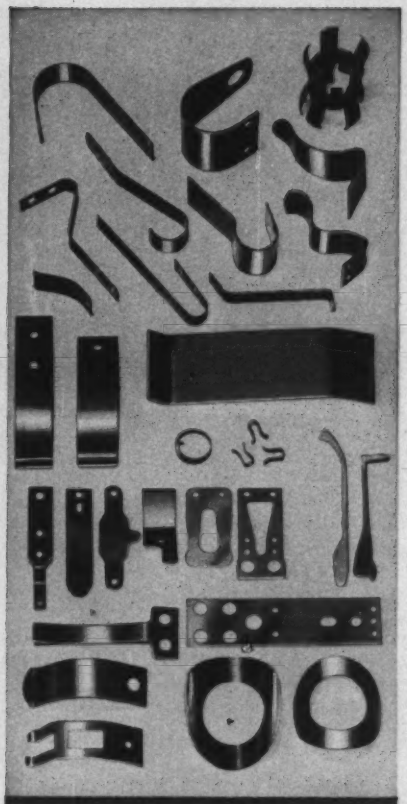


Sheaves ready for assembly on shaft and installation in lifting beam.

For bearings that accomplish the extraordinary in an ordinary manner, write, wire or 'phone Rollway Bearing Co., Syracuse 1, N.Y.

ROLLWAY® BEARINGS

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Seattle • Houston • Philadelphia • Los Angeles • San Francisco



SANDVIK

SPRING STEEL QUALITY

Earns Its Pay By PRECISE PERFORMANCE

Where performance is important, Sandvik spring steel quality is well worth its price. Many spring steel users have found that Sandvik delivers the *exact* performance they want under their tools and in their products.

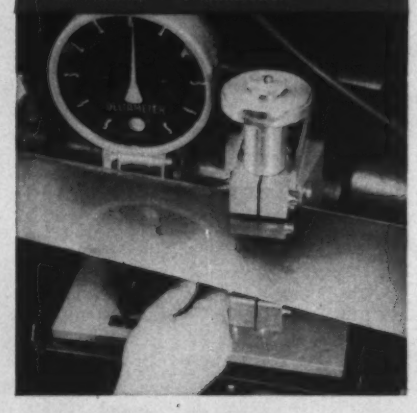
Sandvik's purity, small lot processing and painstaking quality control assures your money's worth in consistent quality performance.

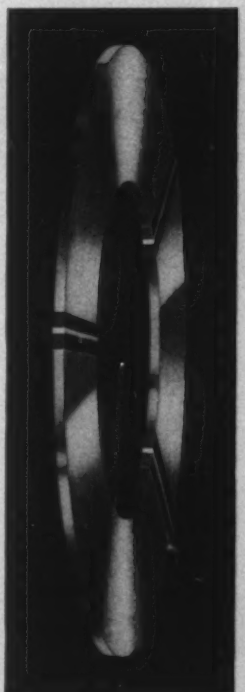
In addition to the wide variety of qualities and sizes carried in stock, Sandvik has local facilities for custom-processing and finishing to your requirements.

For specific physical properties plus accurate flatness, straightness, width, gauge and edge finish, specify a Sandvik spring steel.

Send for free brochure on various Sandvik cold rolled and hardened and tempered strip steels.

Strip thickness is checked during rolling and at final inspection with a "Deltameter", an instrument developed at Sandviken for measuring variations of thousandths of a millimetre.





SANDVIK STEEL, INC.

1702 Nevins Road, Fair Lawn, N. J. SWarthmore 7-6200
• N.Y.C. ALgonquin 5-2200

Branch Offices:
Cleveland • Detroit • Chicago • Los Angeles
SANDVIK CANADIAN LTD. P.O. Drawer 1335, Sta. O. Montreal 9, P. Q.
Works: Sandviken, Sweden

SS-200

CINCINNATI
CINCINN

These CINCINNATI® Shears give

"A most outstanding performance"

"Any job put on our Cincinnati Shears is routine," says C. E. Ball, Assistant Sales Manager of The Hill-Chase Steel Co., big Baltimore warehouse. "They have accomplished a most outstanding performance."

Faced with customers' demands for increased accuracy in sheared sheet, plate, and strip, more and more warehouses are discovering the profits which Cincinnati Shears can bring them.

The fast and sure way to get accuracy in shearing, slitting, and notching is to specify the Cincinnati line. Our representatives will be happy to discuss your application with you.

Photo Courtesy of The Hill-Chase Steel Co.

Shapers / Shears / Press Brakes

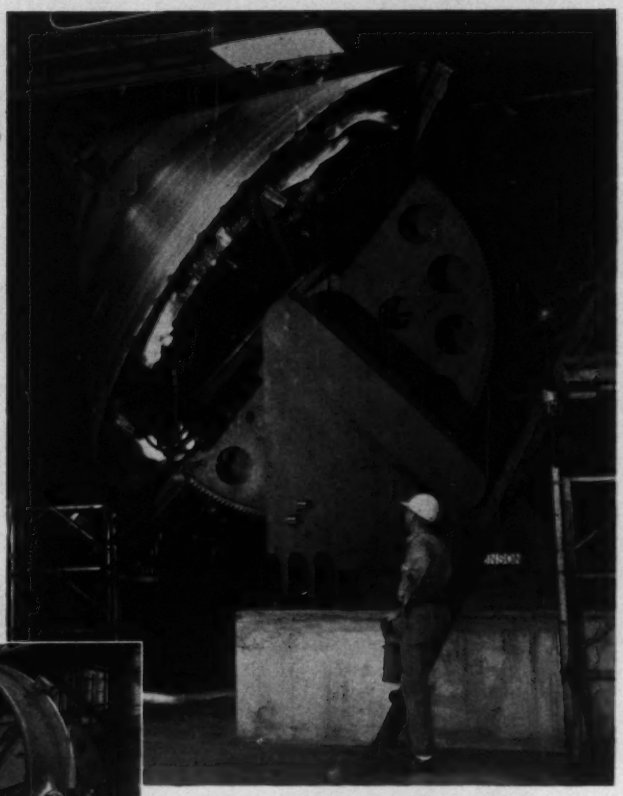
THE CINCINNATI SHAPER CO.

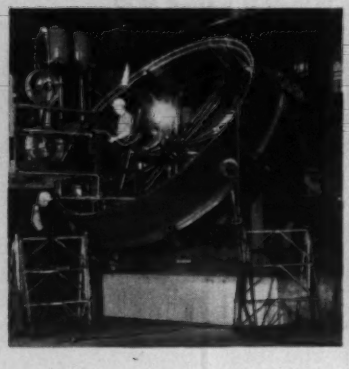
Cincinnati 11, Ohio, U.S.A.

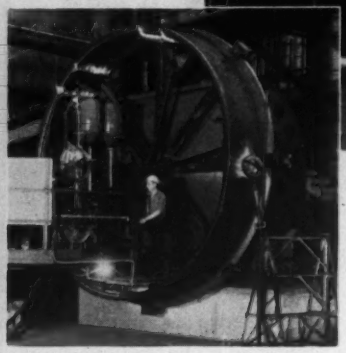
EXCALIBUR...

Welding Positioner 175 TONS CAPACITY

ARONSON Model G3500 "EXCALIBUR" Gear Driven Positioner is used by a large Eastern steel producer for hard-facing bell hoppers for blast furnaces. "EXCALIBUR" provides the greatest precision and economy in the handling of large workpieces.







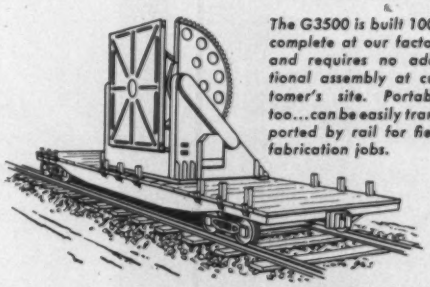
"EXCALIBUR" has been designed to handle almost every kind of weldment at lowest possible shop cost.

"EXCALIBUR" is not physically tremendous, being only 88" from floor to horizontal rotation axis, which allows working both large and small weldments without needing excessive headroom and without working too high above the floor.

"EXCALIBUR" will rotate your weldments as fast as .4 RPM, fast enough for automatic welding down to 8" Dia. and can handle as large a diameter as the factory space permits. It is designed for continuous duty as is encountered when automatic welding hard surfacing jobs where the table may not stop rotating for hours or even for days.

Owning **"EXCALIBUR"** opens production doors to you that are closed to your competitors. It is NOT a special job machine, but a Welding Positioner that will handle 90% of those jobs you now wrestle around the shop floor with the profit-eating crane.

It is quite possible that your capital investment in **"EXCALIBUR"** will be returned in labor and other costs saved in less than three years!



The G3500 is built 100% complete at our factory and requires no additional assembly at customer's site. Portable too...can be easily transported by rail for field fabrication jobs.

Specifications on Request

Quality POSITIONERS by **Aronson MACHINE COMPANY**

ARCADE, NEW YORK

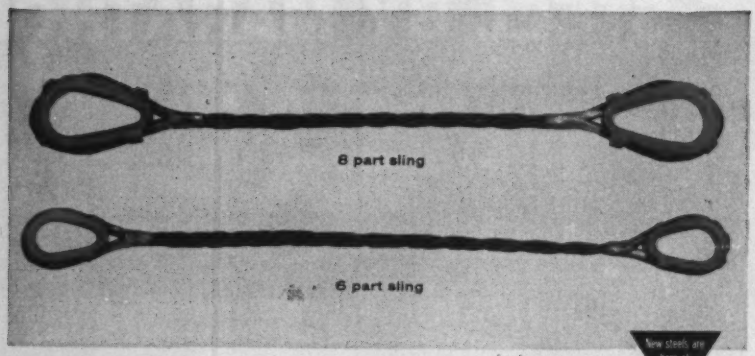
WELDING POSITIONERS • TANK TURNING ROLLS • TURNTABLES

Call on Marathon for steel of the highest quality . . . high speed, tool, alloy, stainless and heat resistant. Available in bars, sheets, wire, castings and forgings, etc., conforming to S.A.E. and A.I.S.I. specifications, plus many other special steels to meet individual requirements. Additional information and details gladly supplied. Contact us for immediate attention to inquiries and special problems.

MARATHON

SPECIALTY STEELS, INCORPORATED

A Division of Deutsche Edelstahlwerke A. G., Krefeld, West Germany DEW 375 Park Avenue, New York 22, N. Y.



Now Tuffy covers all the bases...

NEW HAND-BRAIDED SLINGS

are added to the UNION line

Union Wire Rope Corporation, makers of famous Tuffy patented, 9 part, machine-braided slings, now bring you top quality hand-braided slings. Meet the new members of the Tuffy team:

The hand-braided 6-part sling provides wide bearing area; greatest single-plane flexibility; least strength loss under severe bending; high cutting and twisting resistance.

The hand-braided 8-part sling provides extra wide bearing area, gives extra flexibility in all planes, low strength loss in bending, highest resistance to kinking and spinning.

Like the entire line of Tuffy slings and hoist lines, these new slings are the product of extensive field and laboratory research. They're specially designed for extra strength and flexibility. Tight end-braiding keeps component parts equal in length so that each rope carries its full share of the load.

In these new slings you'll get quality backed by Union Wire Rope experience and integrity. And you'll get a bigger dollar valve in longer service life with greater safety.

Your Tuffy Distributor Will Help You Save Money on Every Sling and Wire Rope Use

He's the man to see when you're replacing or adding slings, hoist lines and wire rope. He is set up for fast service, backed by his nearby Union Wire Rope branch office and warehouse staff and factory engineers. Get in touch with him.

Tuffy® Tips

—on safe use of
Slings and Hoist Lines

Professional Weight Lifters Work the Safety Angles

Here's a tip that could save an injury and absenteeism. The weight lifter's secret is proper leverage. Plus use of major leg muscles instead of back muscles. He never leans over to pick up the load. He squats down as near as possible to it. Lifting action comes from legs and thighs. If your workers must use muscles for some of the lighter lifting jobs, these points are worth remembering. But wherever possible—and always for heavy loads—use hoists and slings.

More Tips for Reducing Materials Handling Accidents

1. Teach your workers rated load factors. Warn them not to overload slings.
2. Use the right size hoist for every heavy lifting job. Don't put the load on muscles.
3. Show workers how to rig hoists properly and safely.
4. Inspect hoist load brakes often. Slipping or dragging brakes are a hazard.
5. Be sure to use the proper sling for the job. Don't assume that all slings made of wire rope are right for all lifting jobs.

FREE!
New Tuffy Sling Handbook

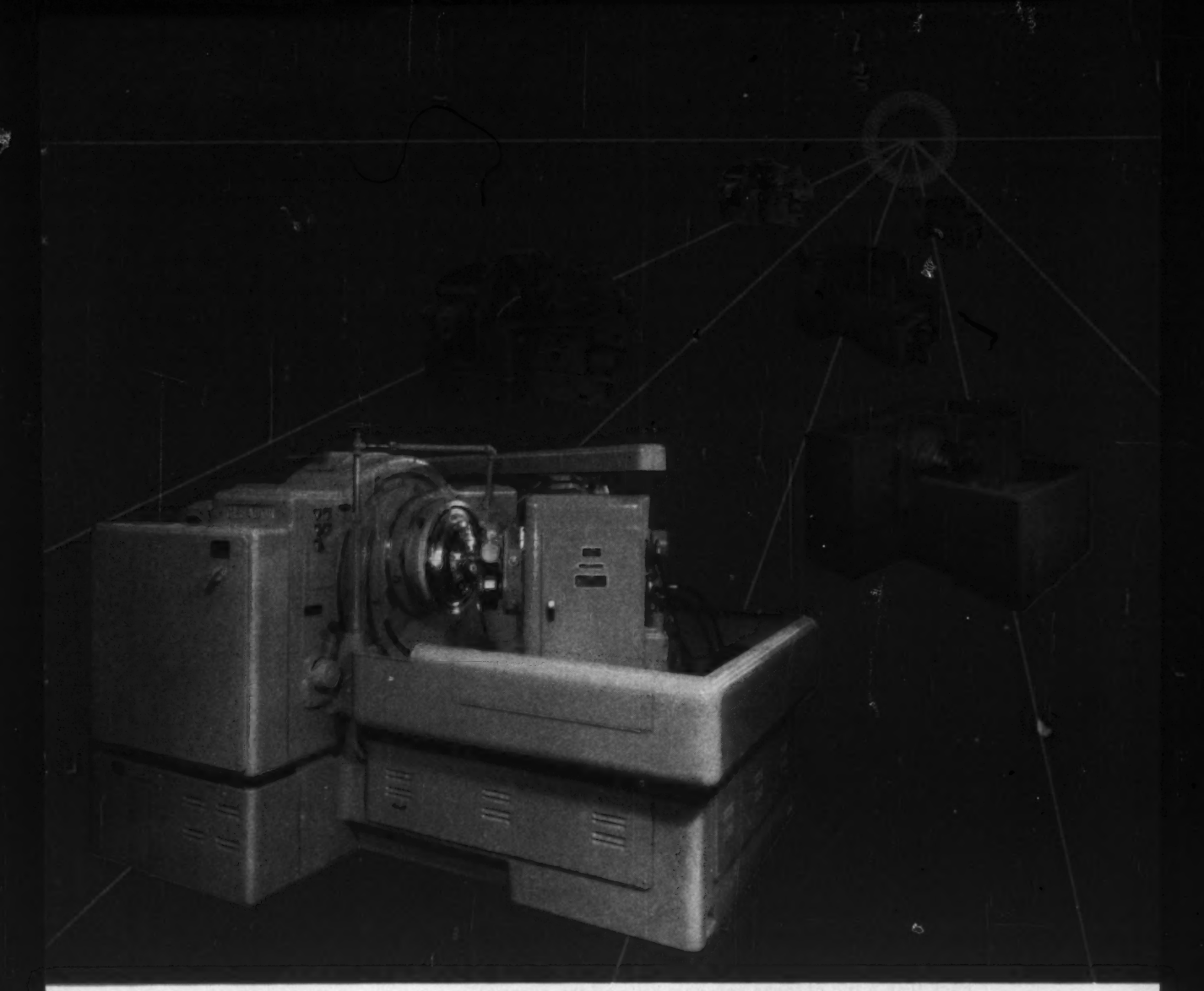
All about slings from A to Z, including types, dimensions and rated loads. Address **Union Wire Rope Corporation, 2160 Manchester Ave., Kansas City 26, Missouri.** Specialists in high carbon wire, wire rope, braided wire fabric, and stress relieved wire and strand.

UNION UNION WIRE ROPE *Wire Rope*

ARMCO®

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products



Now . . . one machine does the work of five!

For small production runs—here's *one* gear-cutting machine with the flexibility of *five!*

The Gleason No. 118 Hypoid Generator roughs and finishes both gears and pinions—using four cutting methods that formerly required a battery of five machines. When production requirements increase, you simply add other machines, the 118 becoming a specialized member of your production team.

1. Single-Cycle® Method. Using this method, you can cut nongenerated gears four to five times faster than previously possible on machines of this type. Cradle and work head are locked in position. The last rotation of the Single-Cycle Cutter finishes both sides of a tooth space. You cut the mating pinions on the same machine, using the conventional single-roll generating method.

2. Cyclex® Method. For certain applications you can use the extremely fast Cyclex Method on the No. 108 Generator. You cut nongenerated gears in one completing operation from the solid blank.

3. Generated Gears and Pinions. You can produce both gears and pinions on this machine with the generating method. Here, a relative rolling motion takes place between gear or pinion and the rotating cutter. Once the gear is chucked in the work head, the machine operation is entirely automatic.

4. Unitool* Method. If you want to cut small quantities of spiral bevel, Zerol® bevel, or hypoid gears with a minimum of tooling, you can use the Unitool Method. You cut both gears and pinions with a single cutter. This method is particularly useful for experimental gears for prototype work.

*Trademark

The No. 118 Hypoid Generator handles gears up to 18″ diameter at a 10:1 ratio, to a *maximum* coarseness of 2 DP. For production of smaller gears, the No. 108 Generator cuts gears up to 8½″ diameter at a 10:1 ratio and to 4 DP. A third model, the No. 28 Hypoid Generator, cuts gears up to 33″ diameter at a 10:1 ratio, 1½ DP.

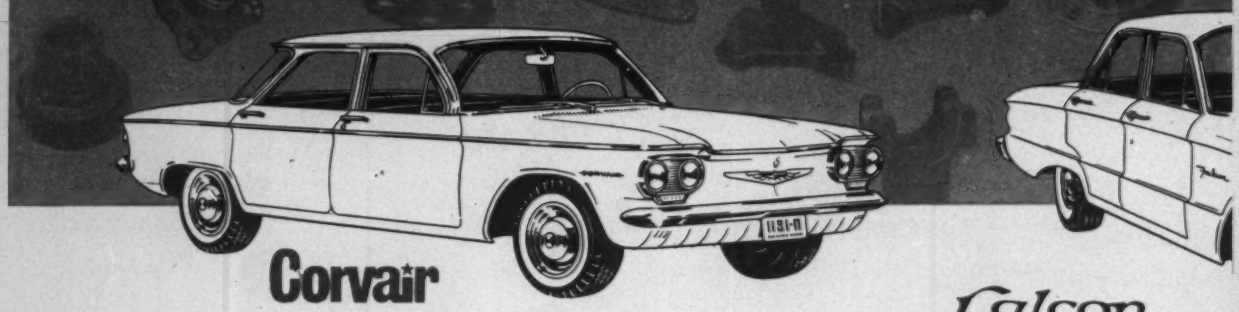
For complete information, send for bulletins on all three machines.

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

Big Three's Little Three

to get Greater Strength for Maximum



Each time a trio of these new cars rolls off the assembly lines at Ford, Chrysler Corporation and Chevrolet, another set of 67 Malleable parts goes into action to give American drivers more dependability, convenience and economy.

Valiant, Corvair and Falcon Use Greater Proportions of Malleable Iron Than the Three Conventional Cars!

Brand new from tread up, the Corvair, Falcon and Valiant are the result of intensive investigation, engineering and testing . . . all done to produce lighter, more economical cars without sacrificing the safety and convenience demanded by the American public.

To accomplish this, the automobile industry's

These companies are members of the

MALLEABLE CASTINGS COUNCIL

CONNECTICUT
Connecticut Mall. Castings Co., New Haven 6
Eastern Malleable Iron Co., Naugatuck
New Haven Malleable Iron Co., New Haven 4

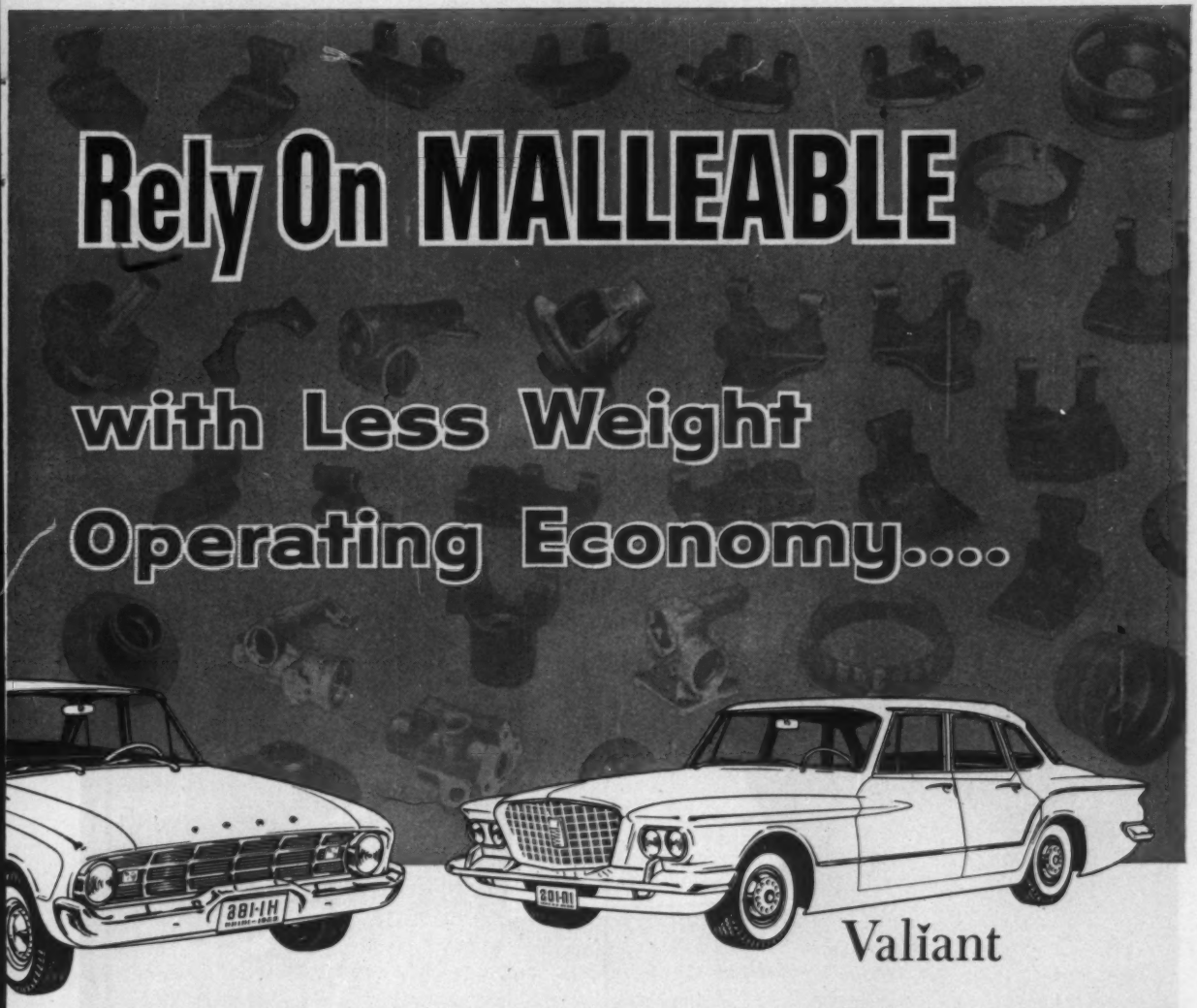
DELAWARE
Eastern Malleable Iron Co., Wilmington 99

ILLINOIS
Central Fdry. Div., Gen. Motors, Danville
Chicago Malleable Castings Co., Chicago 43
Moline Malleable Iron Co., St. Charles
National Mall. and Steel Castings Co., Cicero 50
Peoria Malleable Castings Co., Peoria 1
Wagner Castings Company, Decatur

INDIANA
Link-Belt Company, Indianapolis 6
National Mall. & Steel Castings Co., Indianapolis 22

IOWA
Iowa Malleable Iron Co., Fairfield

MASSACHUSETTS
Belcher Malleable Iron Co., Easton


Rely On MALLEABLE
with Less Weight
Operating Economy....

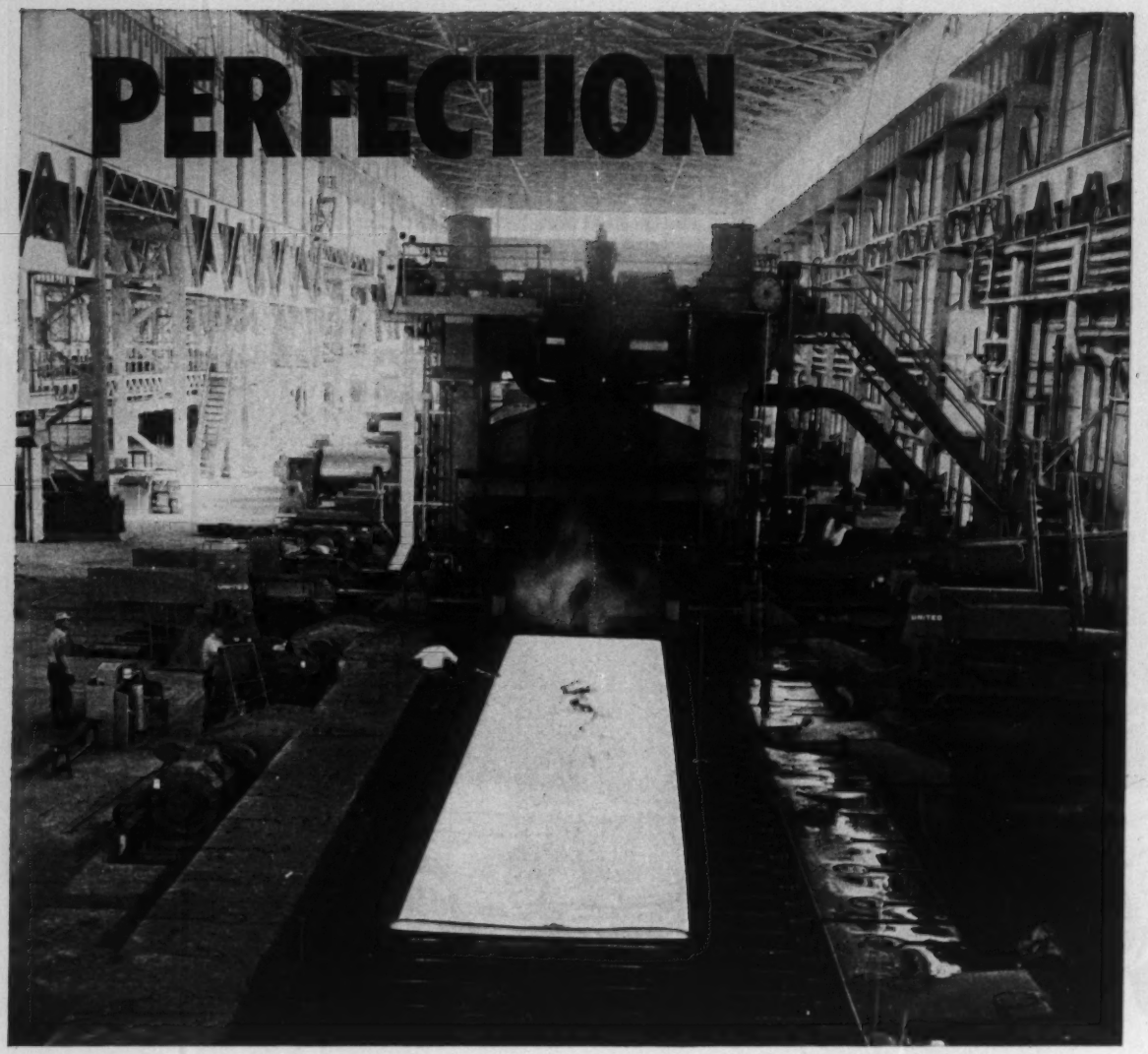
three newest creations use *more* Malleable in proportion to total materials than all other models of the same manufacturers. Why? Malleable provides *more strength per dollar* than any other metal, ferrous or non-ferrous. Malleable castings have *more strength per pound* than "light" metals. Being the *most machinable of all ferrous metals* of similar properties, Malleable speeds production . . . produces better parts. Malleable castings have proved uniquely dependable for critical applications in millions of cars now on the highways.

How many places are there in your operations where Malleable castings can improve your products and reduce your costs? Check now . . . send drawings or an outline of your requirements to any of the progressive Malleable castings producers who display this symbol—

MEMBER
MALLEABLE
CASTINGS COUNCIL

Union Commerce Building, Cleveland 14, Ohio

MICHIGAN
Albion Malleable Iron Co., Albion
Auto Specialties Mfg. Co., Saint Joseph
Cadillac Malleable Iron Co., Cadillac
Central Fdry. Div., Gen. Motors, Saginaw
MINNESOTA
Northern Malleable Iron Co., St. Paul 6
NEW HAMPSHIRE
Laconia Malleable Iron Co., Laconia
NEW YORK
Acme Steel & Mall. Iron Works, Buffalo 7
Frazer & Jones Company Division
Eastern Malleable Iron Co., Solvay
Oriskany Malleable Iron Co., Inc., Oriskany
Westmoreland Mall. Iron Co., Westmoreland
OHIO
American Malleable Castings Co., Marion
Central Fdry. Div., Gen. Motors, Defiance
Dayton Mall. Iron Co., Ironton Div., Ironton
Dayton Mall. Iron Co., Ohio Mall. Div., Columbus 16
Maumee Malleable Castings Co., Toledo 5
National Mall. and Steel Castings Co., Cleveland 6
PENNSYLVANIA
Buck Iron Company, Inc., Philadelphia 22
Erie Malleable Iron Co., Erie
Lancaster Malleable Castings Co., Lancaster
Lehigh Foundries Company, Easton
Meadville Malleable Iron Co., Meadville
Pennsylvania Malleable Iron Corp., Lancaster
TEXAS
Texas Foundries, Inc., Lufkin
WEST VIRGINIA
West Virginia Mall. Iron Co., Point Pleasant
WISCONSIN
Chain Belt Company, Milwaukee 1
Federal Malleable Company, Inc., West Allis 14
Kirsh Foundry Inc., Beaver Dam
Lakeside Malleable Castings Co., Racine
Milwaukee Malleable & Grey Iron Works, Milwaukee 46



Fuji's modern 160" plate mill

From Pig to Finished Products

FUJI IRON & STEEL CO., LTD., a giant among Asia's steelmakers, has made vast strides towards achievement of perfection in all phases of iron and steel production. FUJI STEEL products can be depended upon because rigid control is maintained over quality at all essential points.

FUJI IRON & STEEL CO., LTD.

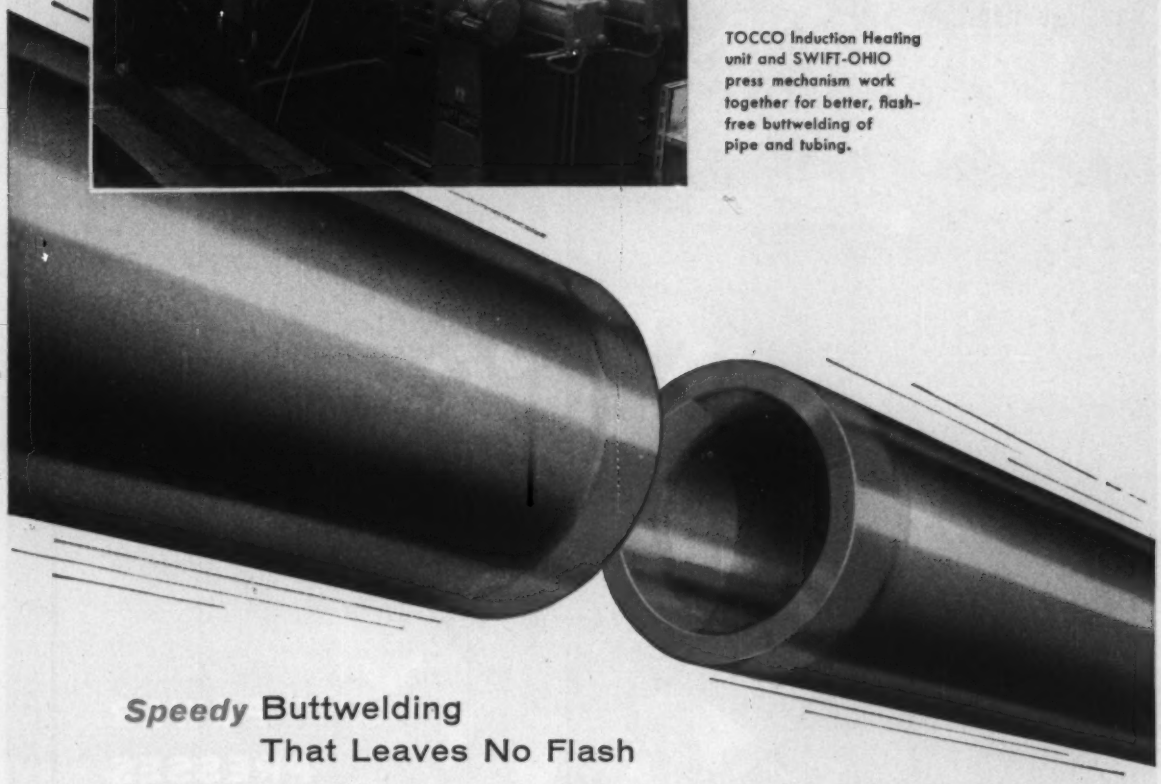
Cable: STEELFUJI TOKYO

Head Office
Tokyo, Japan

New York Office
Room 805, 52 Broadway
New York 4, N.Y.
United States of America

European Office
Graf-Adolf Str. 86/88
Dusseldorf
Germany

TOCCO Induction Heating unit and SWIFT-OHIO press mechanism work together for better, flash-free buttwelding of pipe and tubing.



Speedy Buttwelding That Leaves No Flash

with TOCCO* Induction Heating

Now, in less than a minute you can get flash-free, smooth joints on any size pipe, regardless of its diameter or wall thickness.

Conventional buttwelding methods produce strong, sound joints but leave a brittle flash inside or outside the pipe. Inside flash can seriously impede fluid flow. Particularly on long lengths of pipe, removal of this inside flash is a real production headache—time consuming and expensive.

Whether *your* production bottleneck involves buttwelding, soldering, brazing, heat treating or forging, it pays you to investigate TOCCO as an economical way to do it better, faster and at lower cost.

TOCCO

JUST PUSH A BUTTON

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today— NEW FREE Bulletin

The Ohio Crankshaft Co. • Dept. S-1, Cleveland 5, Ohio

Please send reprint of article from STEEL Magazine entitled "Buttwelder Leaves No Flash".

Name_____

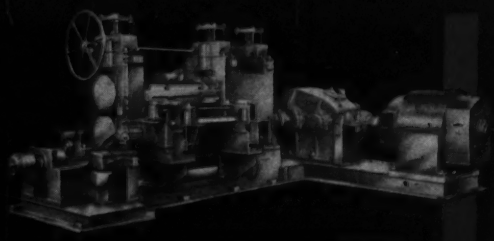
Position_____

Company_____

Address_____

City_____ Zone____ State_____

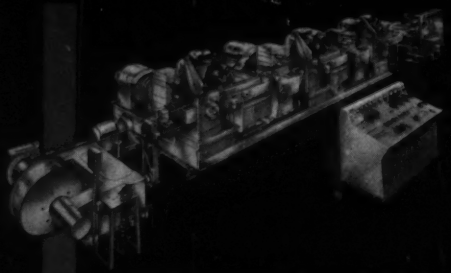
COLD HEADING
MACHINERY



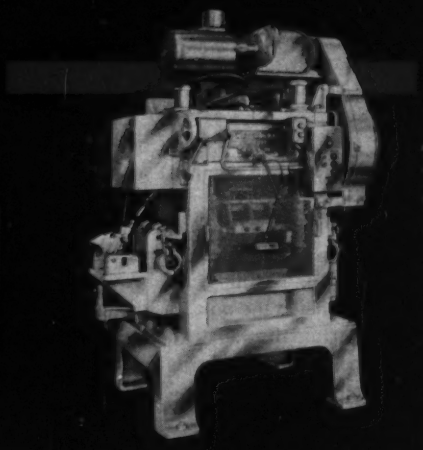
EYELET, SLITTER
& WIRE
MACHINERY

WATERBURY
MACHINERY BUILDERS
FARREL

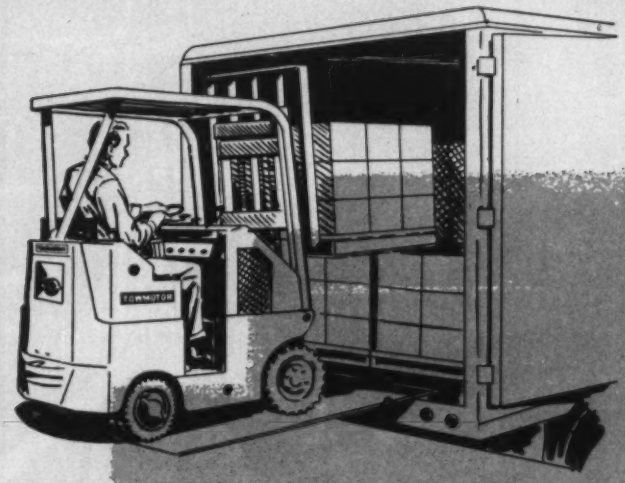
POWER
PRESSES



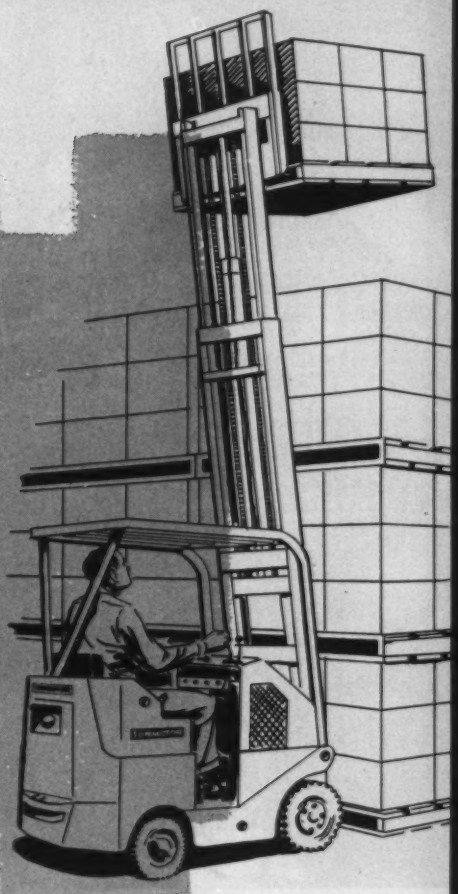
ROLLING MILL
MACHINERY



THE WATERBURY FARREL FOUNDRY & MACHINE CO.
DIVISION OF TEXTRON INC.
Waterbury, Connecticut, U.S.A.
Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.



LOW CEILING! Less than six feet high, this Model 410 safely enters low-headroom vans, trailers, trucks and boxcars. And the new Towmotor High Free Lift Triple Mast—providing 65" of "free lift" at 180" of lift—permits floor-to-roof loading!



HIGH CEILING! Same fork lift truck stacks ton-loads of materials onto 12-foot tiers. Standard Towmotor Overhead Guard offers extra protection for operator. (Other models in "Van-Stack" series handle loads up to 3000 pounds.)

Introducing
Towmotor "Van-Stack"
Series Fork Lift Trucks

New Towmotor does double duty!

You'll profit in many extra ways by owning a new Towmotor "Van-Stack" Series Fork Lift Truck.

"Almost unbelievable—but I saw it!" said an amazed MHI Show-goer who witnessed this double-duty lift truck in action in June. Thousands saw it drive in low-headroom trailer, load it to roof, then stack heavy units on 12-foot high tiers.

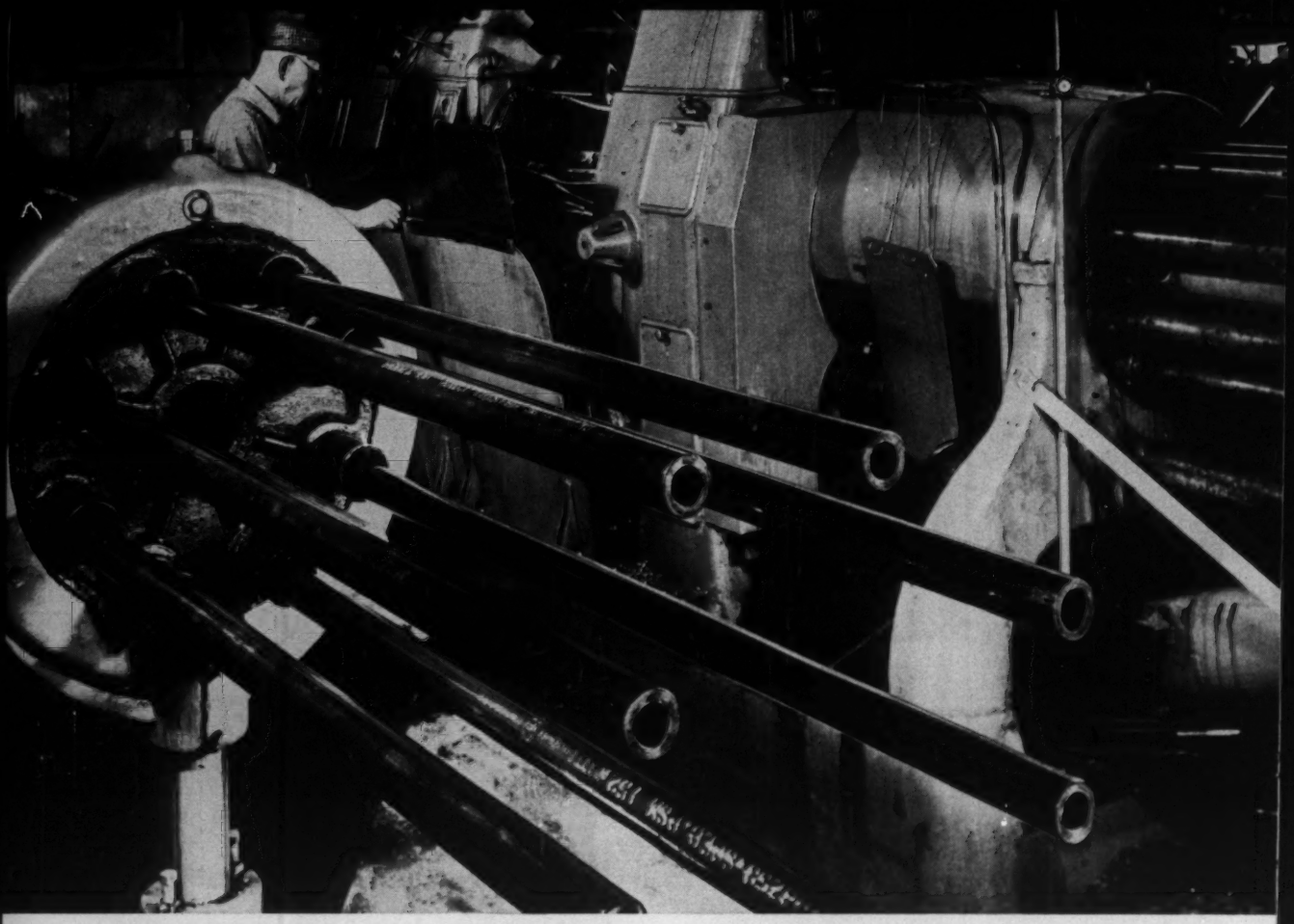
This truck (only 32" wide) zips through congested 3-foot aisles—maneuvers sharp corners—hustles big loads indoors and out—and enters elevators for fast floor-to-floor service.

On top of all this, its increased hoisting speed, dual-entry convenience, powerful 4-cylinder "economy" gas or LP-gas engine, weatherproof instrument panel—and other exclusive Towmotor features—make it the foremost fork lift truck in 2000-3000 pound class! Ask for *"Van-Stack" Series Folder SP-25.* Write Towmotor Corporation, Cleveland 10, Ohio.

TOWMOTOR ® **-GERLINGER** LEADERS FOR 40 YEARS IN BUILDING FORK LIFT TRUCKS, CARRIERS AND TRACTORS

THE ONE-MAN-GANG

Gerlinger Carrier Co. is a subsidiary of Towmotor Corporation



Bearings in the making are these lengths of Pittsburgh seamless mechanical tubing in the charging rack of a high-speed automatic cutting machine at the plant of a leading bearing manufacturer. Special machining, hardening properties are built into tubes for this customer who produces more than 6,000 inner-rings per day.

Leading Bearing Maker Finds . . .

Machinability of Pittsburgh Steel's Tubes Lengthens Tool Life, Gives More Pieces

One of the nation's oldest and largest ball bearing makers used alloy bars for high-speed machining of a difficult bearing part for 20 years.

But when Pittsburgh Steel Company showed how low-carbon steel tubes could provide the machining and case-hardening properties required, this big-name manufacturer switched to Pittsburgh seamless mechanical tubing.

These were the clinchers:

- **More pieces per day**
- **Longer tool life**
- **Less machining and scrap**
- **Lower cost material**

The part involved was the inner-ring of a clutch throw-out bearing—a heavy production item at this customer's biggest plant since 1937. The bearing is the part that takes the abuse from the spinning clutch pressure-plate when you step on the clutch pedal.

To produce the inner-ring from low carbon steel, the customer demanded seamless tubing that was:

Highly machinable and uniform—for charging into a battery of 8-spindle automatic screw machines which subject each piece to 16 cutting operations.

Exceptionally hardenable and fine grained—for heat-treating to the hardness demanded of bearing steel and for finishing to ultra-close tolerance and super-fine surface.

The customer specified the grade of steel he needed to obtain these properties—AISI C-1024—then asked Pittsburgh Steel's sales engineers to produce it in seamless mechanical tubing.

The bearing maker's automatic machines produce 6,000 to 6,500 bearing inner-rings a day, testing the tubing's machinability with cutting tolerances as little as .003 inch.

Its hardening properties are

proven in a 21½-hour carburizing-hardening-temper cycle.

Structural characteristics meet the test in an integrated finishing-assembly operation that includes grinding and honing, and two 100 percent test operations.

The bearing maker's superintendent of primary operations sums up the advantages of Pittsburgh Steel's mechanical tubing this way:

"We get more pieces during a day's operation. And we don't have as many chips to pull.

"We can use a boring tool and this stays in service longer than the drill needed for bar stock. Other tools used for ID cuts also stay in longer. So there we have lower tool costs.

"Finally, we are using a less expensive steel and gaining cycle speed. Since the inside drill speed is the controlling factor on cycle speed for bar stock, the elimination of this operation and the substitution of a boring tool permits cycle speeds of 25 seconds for tubing compared with 28 seconds for alloy bar stock or a little over 10 percent reduction."

This customer's experience with Pittsburgh Steel's seamless tubing—the advantages, the quality, the results—is typical of Pittsburgh Steel's ability to supply tubular products for special applications and of its ability to help customers obtain more profitable production.

These same benefits can be tailored to the needs of your operation requiring seamless mechanical tubing or any of the other tubular products made by the skilled tubemakers at Pittsburgh Steel Company.

Initial assembly—one of two 100 percent testing operations—is where seamless shows its merits in finished bearing.

Tubing proves its machinability here where it takes 16 boring, reaming, grooving, recessing and burnishing cuts.

Pittsburgh Seamless Distributors

Baker Steel & Tube Company
Los Angeles, California

Chicago Tube & Iron Company
Chicago, Illinois

Cleveland Tool & Supply Co.
Cleveland, Ohio

Drummond McCall & Co., Ltd.
Montreal, Quebec, Canada

Edgcomb Steel Company
Philadelphia, Pennsylvania

Gilmore Steel & Supply Co.
San Francisco, California

Earle M. Jorgensen Co.

Perry Kilsby, Inc.
Los Angeles, California

Mapes & Sprowl Steel Co.
Union, New Jersey

Metal Goods Corporation
St. Louis, Missouri

Miller Steel Company, Inc.
Hillside, New Jersey

A. B. Murray Co., Inc.
Elizabeth, New Jersey

C. A. Russell, Inc.
Houston, Texas

Ryerson, Joseph T. & Son, Inc.
Chicago, Illinois

Solar Steel Corporation
Cleveland, Ohio

Steel Sales Corporation
Chicago, Illinois

Tubular Sales
Detroit, Michigan

Ward Steel Service Company
Dayton, Ohio

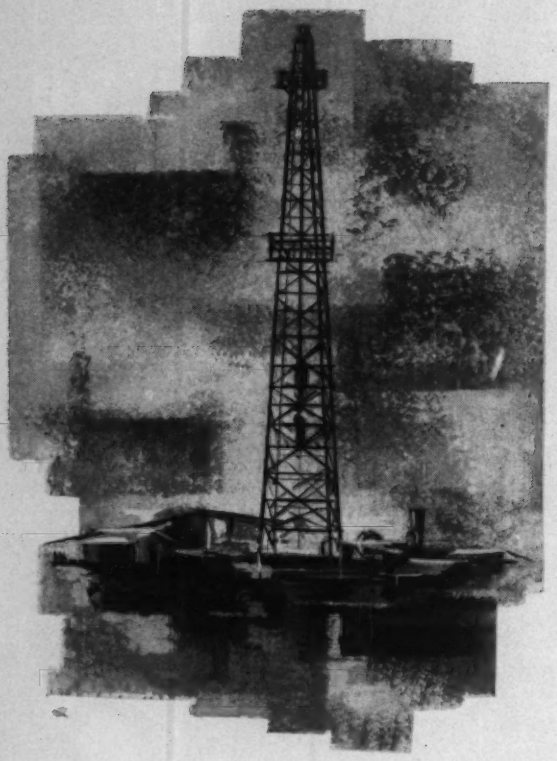
Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Atlanta, Chicago, Cleveland, Dayton, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Tulsa, Warren, Ohio

New steels are born at Armco



from derricks to doll buggies . . .

Sheffield has the right bolts

Sheffield bolts are vital parts of thousands of manufactured products. They range from automobiles to zipper-making machines. From oil field rigs to toys for tots. The list is next to endless.

In all their many applications, one thing is uniformly true of every Sheffield bolt: it's the best that modern metallurgy, engineering minds and advanced machinery can produce. It's Sheffield-made and quality-controlled from furnace to finished bolt.

From one of the world's largest bolt plants, Sheffield can meet your steel bolt needs—any kind, any quantity—with top quality and quick delivery. Whether it's a standard or special bolt—or one custom-made to your specifications—you'll get the right bolt fast from Sheffield. Just get in touch with your Sheffield Man.

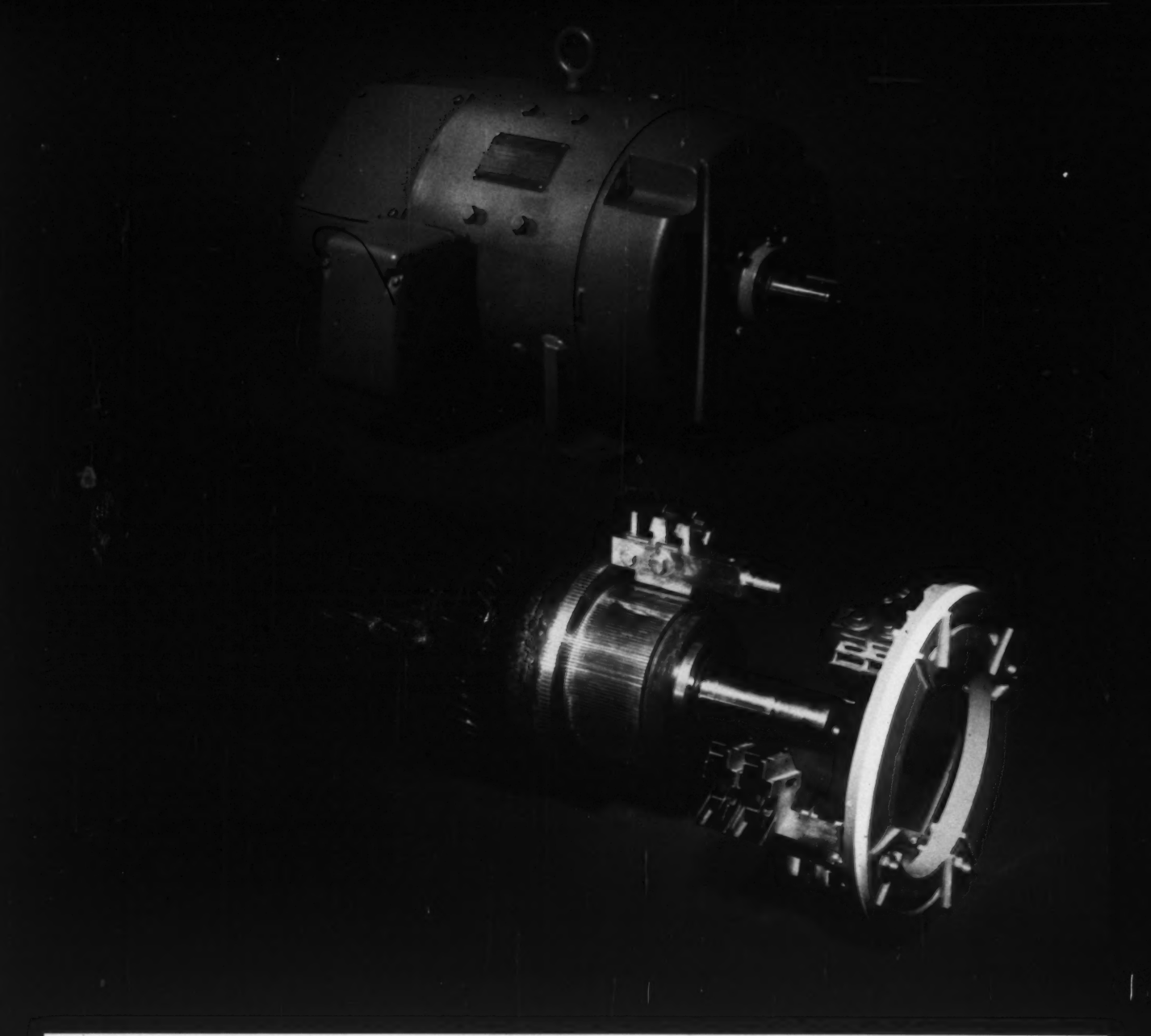
SHEFFIELD
ARMCO

BOLT PRODUCTS

SHEFFIELD DIVISION

ARMCO STEEL CORPORATION

OTHER DIVISIONS AND SUBSIDIARIES: Armco Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products



NEW GENERAL ELECTRIC DC MOTOR GIVES

Extra Power To Meet Peak Loads

KINAMATIC* . . . *a new standard in industrial direct-current motors* . . . designed to meet the vital power load requirements of modern manufacturing methods.

Proper Design Balance . . . means unmatched commutating ability . . . the ability to deliver the short bursts of power required for quick acceleration and deceleration. Fewer turns per armature coil . . . full complement of commutating poles . . . maximum number of commutator segments, combine to permit higher peak loads.

New Brush Assembly . . . constant-pressure brush springs eliminate brush adjustments. Bronze, corrosion-resistant brush holders are mounted on square steel studs for stable operation in both directions of rotation. Molded polyester-glass yoke resists impact, intense heat and corrosion.

D-c Kinamatic Motors offer a reliable key to successful automation. Additional information is available at your nearest General Electric Apparatus Sales Office. Or, if you prefer, write for Bulletin GEA-6355, *Direct Current Motor and Generator Department, Erie, Pennsylvania.*

*Trade-Mark of General Electric Company. 813-11

Progress Is Our Most Important Product

GENERAL ELECTRIC

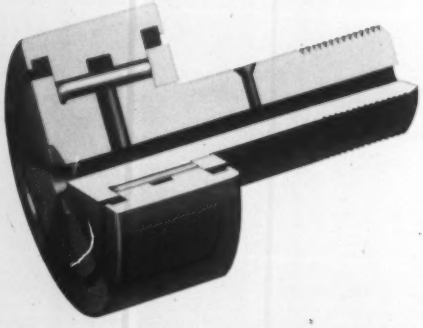
only McGILL® sealed *CAMROL*® cam followers give you . . .

effective sealing

prelubrication

high radial and shock capacity

in a full range of sizes



Effective sealing of the CAMROL cam follower against moisture, dirt, chips, etc. guarantees longer service life . . . reduces maintenance. This sealed construction retains lubricant and eliminates need for frequent relubrication, so often undesirable in cam action, guide support and track roller applications.

Special seals are built in at stud and flange ends. A black oxide finish on all exposed surfaces offers outside corrosion resistance. The channeled reservoir above the rollers in the outer raceway bore helps store reserve lubricant, sufficient in most cases for lifetime service. Relubrication is possible through convenient oil holes. The new SCF sealed CAMROL cam followers interchange with proven standard CAMROL cam followers. Standard stock with roll diameters up to 4″ are available for both stud and shaft mounting.

For maximum bearing life where contamination is a problem, specify sealed CAMROL cam followers. Ask your McGill representative or our engineering department for recommendations.

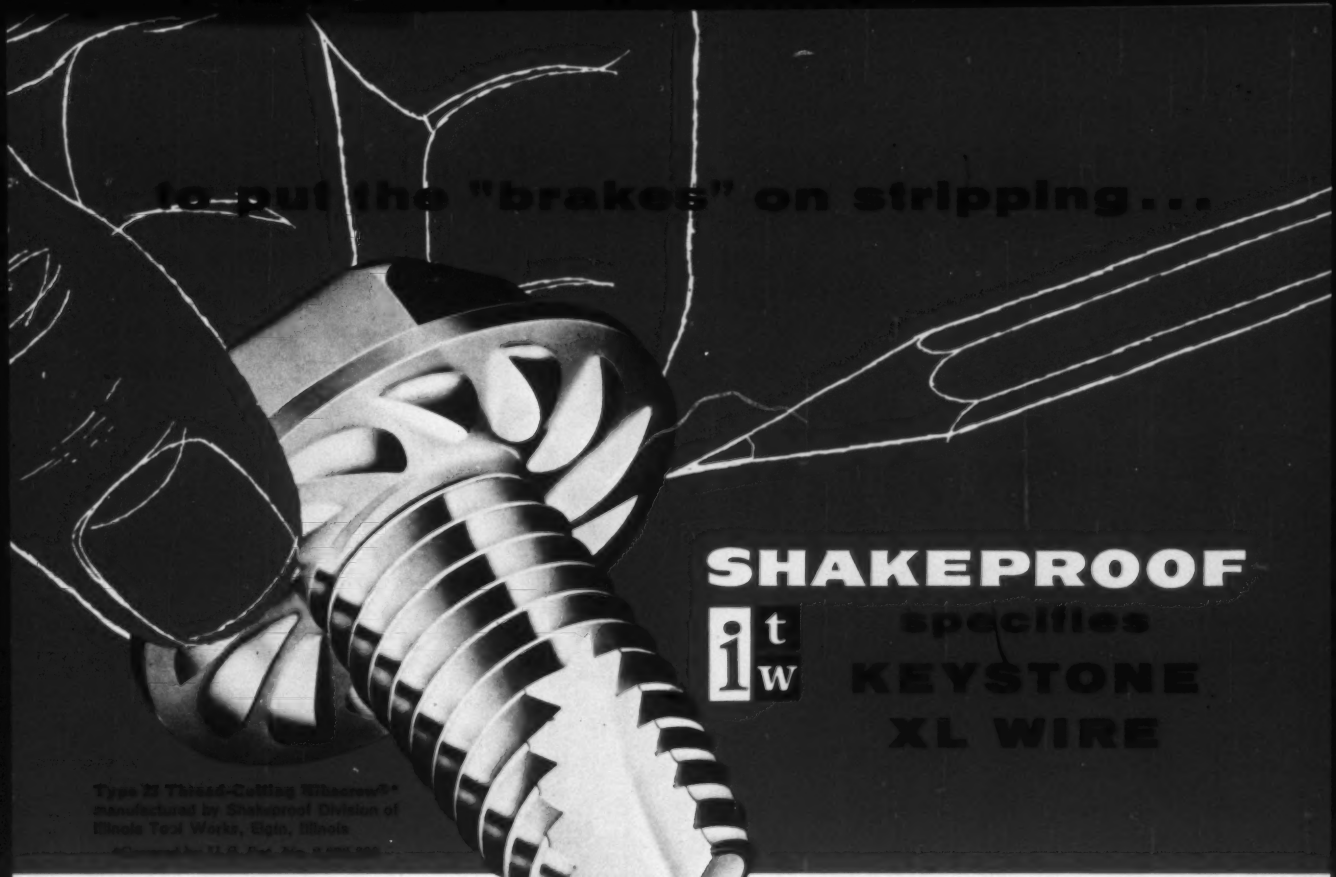
Write for Catalog No. 52-A

engineered electrical products

McGILL®

precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., BEARING DIV., 301 N. LAFAYETTE ST., VALPARAISO, INDIANA



flowability

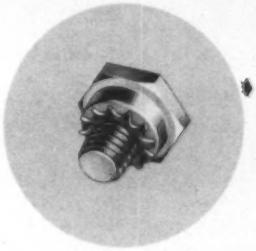
MAKES THE DIFFERENCE

The specially shaped Nibs under the head of this Shakeproof® Thread-Cutting Screw are designed to act as torque brakes. As the screw is driven, the Nibs make contact with the work surface and "eat up" excessive driving torques. This prevents stripping the threads from over-tightening and also permits a broader range of driver settings.

For effective braking action, each Nib must be sharp and precisely formed. So, material must flow deep into the die cavities to fill out each Nib. Keystone XL Wire does the job—uniformly, consistently and precisely.

There are many other examples of how Shakeproof puts the *flowability* qualities of Keystone XL Wire to good use, increasing production and quality. If you'd like to learn more about these qualities, call your Keystone representative. Our metallurgists are at your service.

Keystone Steel & Wire Company, Peoria 7, Illinois



Sems-by-Shakeproof—5⅛ diameter head plus shoulder makes this a good example of the *flowability* of Keystone XL Wire.

Mounting Screw combines left- and right-hand threads on the same shank as well as Nibs under the head. Left-hand thread and extruded lower thread section make this an exacting job.

KEYSTONE XL WIRE STUDY

KEYSTONE

WIRE FOR INDUSTRY

3 NEW SERIES IR SCREW DRIVERS

give you an ANNUAL DIVIDEND on your PAYROLL DOLLARS

NEW **DESIGNS SPEEDS POWER**

If your operators are using older model screw drivers, you can increase their man-hour productivity by as much as $3750 Payroll Dollars in one year, just by replacing the older tools with one of the three new I-R designs.

Multiply these *Annual Dividends* by the number of screw driver operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R screw drivers can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-925

OUR AFFLUENT ECONOMY . . .

	1940	1960	INCREASE
Metalworking sales	$23.3 billion	$156.5 billion	572%
Gross national product	$100.6 billion	$510 billion	407%
Capital goods expenditures	$6.5 billion	$38 billion	485%
Steel capacity (tons)	81.6 million	150 million	84%
Steel production (tons)	67 million	130 million	94%
Passenger car output (units)	3.8 million	6.9 million	82%
Aluminum production* (tons)	286,642	2.6 million	809%
Refined copper production (tons)	1,033,710	1.6 million	55%
Slab zinc production (tons)	706,100	1 million	42%
Refined lead production* (tons)	685,480	915,000	33%
Population	132 million	181 million	37%
Civilian labor force	55.6 million	70.4 million	26%
Total employment	47.5 million	67.4 million	42%
Manufacturing employment	10.8 million	16.7 million	55%
Metalworking production workers	3.2 million	5.9 million	84%
Personal income	$78.7 billion	$400 billion	408%
Consumer expenditures	$71.9 billion	$331 billion	360%
For durable goods	$7.8 billion	$49 billion	528%
For nondurables	$37.2 billion	$154 billion	314%
Steel industry hourly earnings	$0.85	†	239%[1]
Manufacturing hourly earnings	$0.66	$2.29	247%
Metalworking hourly earnings	$0.80[2]	$2.52	215%
Wholesale price index (1947-49=100)	51.1	122	139%

*Primary and secondary. †Was $3.34 in 1959. [1]Increase from 1940 to 1959. [2]Approximate.

It's Here: A Half Trillion Dollar Year

The decade of the '60s begins with the nation's first half trillion dollar year and could end with the first year to produce three-quarters of a trillion dollars. Expect a gross national product of $510 billion this year vs. $480.3 billion last year. We'll experience an annual rate of $500 billion this quarter, $509 billion in the second quarter, $514 billion in the third, and $517 billion in the last. The Federal Reserve Board's industrial production index should average about 162 for the year. The high point—165—will probably be reached in April or May.

Consumer Outlays to Peak: More Inflation on the Way

Look for the government's wholesale price index to reach 121 in June and continue to 122 by December. Industrial prices will be lifted around 2 per

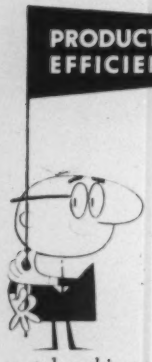
cent during the year. Consumers are on a spending spree: Their personal income will reach the $400 billion mark for the first time. And they're generally optimistic. So tight credit policies won't hold them back significantly. They'll pay about 2 per cent more, on the average, for the products they buy as the consumer price index heads for 126.5 in June and 127.5 in December. Consumers will buy about $49 billion worth of durable goods in '60 (up more than $5 billion from '59) and about $154 billion worth of nondurables.

What Metalworking Managers Expect

Managers responding to STEEL's annual survey (Page 97) expect metalworking sales to reach a record $156.5 billion this year—up nearly 8 per cent from last year's volume. Steel ingot production will climb to 130 million tons—37.5 million more than was produced last year and 13 million more than the previous record chalked up in 1955. Expect the mills to turn out 70 million tons in the first half and 60 million in the second. Aluminum production (primary and secondary) will jump to 2.6 million tons this year—up 300,000 tons from '59 output.

A BOOM in Capital Spending

Look for capital goods expenditures to soar to $38 billion this year—up $5 billion or more from the 1959 total. Metalworking's outlays will climb significantly. For equipment alone, the metalworking industries will spend a record $5.65 billion this year vs. last year's $4.57 billion.



. . . Goal of the Year

This year's outlays for production equipment, although at an all-time high, will fall far short of the need. A STEEL survey finds that metalworking would have to spend more than $20 billion to achieve optimum production efficiency. Failure to keep facilities modern is leading to gigantic sales losses. Foreign competitors, with modern equipment and lower employment costs, are biting off bigger and bigger chunks of American markets. This is the year that U. S. metalworking will begin its counterattack. STEEL will help by pointing out how to achieve efficiency through the systematic purchase and use of production equipment and through more effective management of materials (Page 93).

Profits Will Improve, But the Pinch Remains

Expect total corporate profits, before taxes, to reach $52 billion this year. That compares with $47 billion last year and a disappointing $36 billion in

1958. Despite the improvement, they'll be inadequate as metalworking battles price competition, mounting labor costs, inadequate depreciation allowances, and frightening foreign competition. Dividends will probably approach $15 billion compared with last year's $13.25 billion. To boost your profit margins, you need good information (Page 137).

From Motordom, a Big Boost for Metalworking

Look for U. S. carmakers to produce 6.9 million automobiles this year vs. 5.5 million last year. Sales of domestic cars should exceed 6.6 million. And Americans will probably buy around 600,000 imported jobs. Truck production may surpass 1.21 million units vs. last year's 1.13 million. Compact cars will chew off a bigger share of the market, believe authorities like AMC's George Romney (right). Simplification and reliability will be Detroit's watchwords this year (Page 117).

In Inventories, the Push Is on

Inventory building is the factor that could push GNP above the $500 billion annual rate in the first quarter. Look for these quarterly inventory accumulation rates: $10 billion in the first quarter, $10 billion in the second, $8 billion in the third, $6 billion in the fourth. And expect metalworking management to take a deeper interest in inventory control this year. Unwieldy stocks not only play havoc with your profits; they lead to nationwide recessions. Some economists are already talking about an inventory recession in 1961.

In Washington, Your Help Is Needed

Look for more than the usual amount of ranting and raving in Washington this year. Reason: The impending Presidential election. Most observers see antibusiness sentiment arising in the Capitol. It signals the need for businessmen to take a more active interest in politics. Commerce Secretary F. H. Mueller (left) suggests that you speak up more often on vital issues, write letters, circulate printed material, brief your congressmen (Page 106).

Government Spending: Upswing at the Local Level

Watch for federal government purchases of goods and services to rise less than $1 billion. But expect spending by state and local governments to jump about $3 billion—to $47.5 billion. Defense spending will hold close to the 1959 level.

Construction: Headed for Another Record

Look for total new construction to top $55 billion this year—up about 2 per cent from last year's $54 billion mark. The dollar volume increase will be

almost entirely due to higher building costs. The strongest area will be industrial building; it may reach $2.5 billion vs. $1.95 billion last year). The total volume of private construction is expected to reach $40 billion. Housing starts will drop from last year's 1.35 million to about 1.2 million. Commercial construction will be up about $600 million to $4.45 billion.

Machinery: Out of the Bust and into the Boom

Machinery makers will complete the transition from a starvation diet to a holiday menu. Look for producers of nonelectrical machinery to sell $31 billion worth of their products this year—8 per cent more than last year. Machine tool makers will beat that rate of increase. Producers of electrical machinery and equipment can look for a sales gain of about 10 per cent, boosting their volume over the $25 billion mark.

Farm Equipment: No Share in the Sunlight

The farm equipment industry is one of the few metalworking segments that will fail to share in the 1960 business upswing. Farm income dropped last year and is expected to slide a little more this year. So equipment sales may be down 10 per cent from last year's pace. But farm equipment makers will buy at least as much steel this year as last because they are heading into the year with critically low inventories.

Appliances: Up, Thanks to Replacement Market

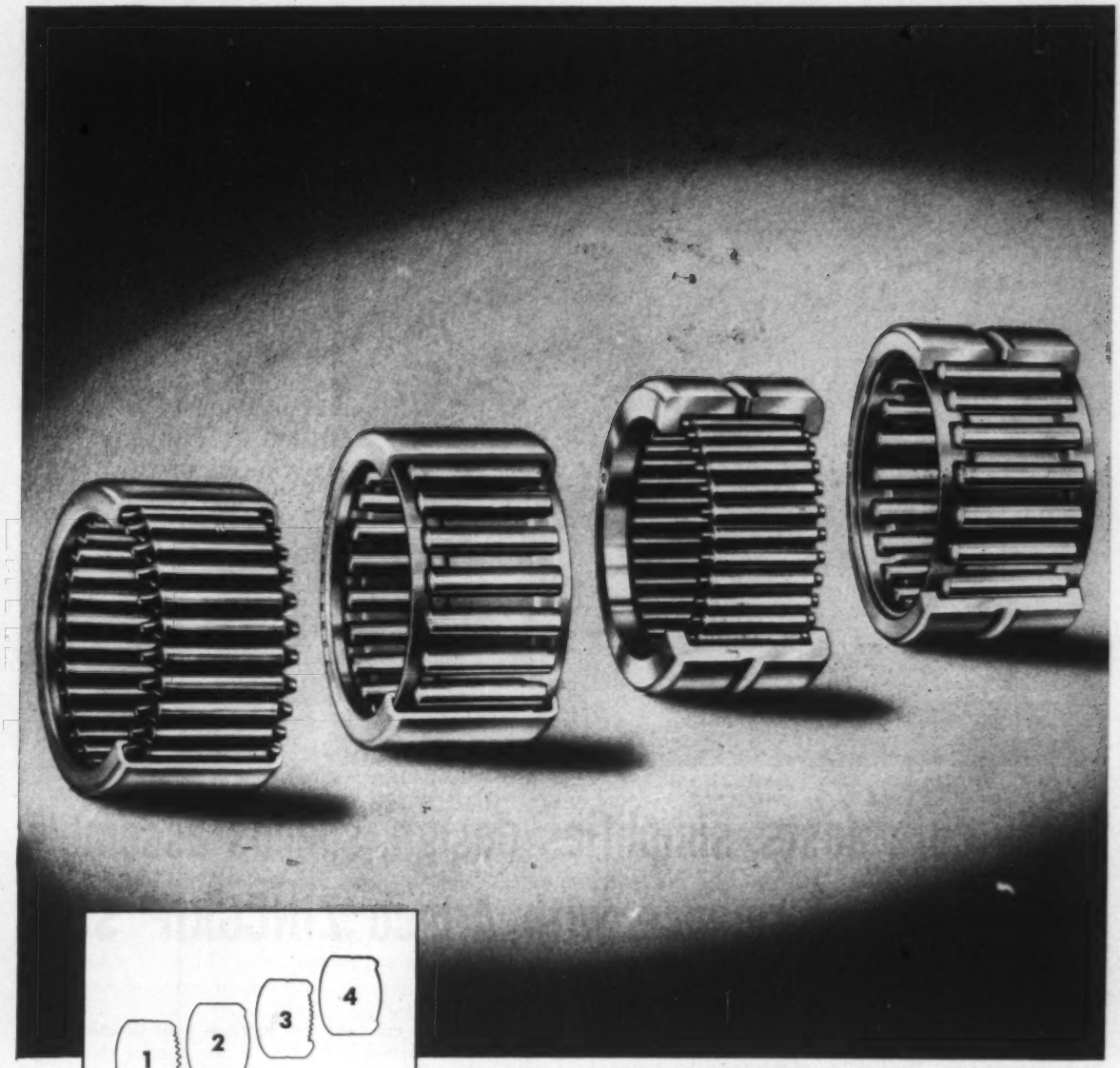
Personal income is slated to hit $400 billion this year, with net disposable income rising to around $352 billion (up $18 billion from '59). That gain, coupled with purchases that have been deferred due to steel shortages, will more than offset the decline in housing starts. Net result: Appliance sales in '60 will be about 5 per cent higher than in 1959. Added importance is given to the replacement market because of this: Major appliances are replaced about every 10 to 12 years; 1947, '48, and '49 were big years for whitegoods.

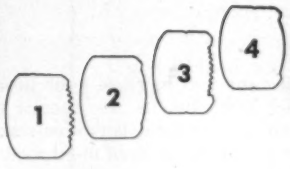
Containers: The Annual Growth Rate Continues

Expect container manufacturers' sales in '60 to be 3 to 4 per cent above the 1959 level. That has been the normal rate of growth in this industry. Pricing remains the industry's biggest problem. Savage competition forces manufacturers to maintain a cautious policy on price hikes—despite spiraling costs.

Oil and Gas Hardware: A Small Gain in Prospect

This industry will consume more than 800,000 tons of steel in 1960 vs. around 575,000 tons last year. The bulk of the increase will result from inventory building. Between 52,000 and 53,000 wells will be drilled this year compared with less than 51,000 last year. Net result: Slightly higher sales for oil country suppliers.





Torrington Drawn Cup Needle Bearing... for maximum radial capacity in minimum cross section... positioned by press fit—snap rings or shoulders unnecessary... runs directly on hardened shaft... most compact, light weight, economical.

Torrington Drawn Cup Roller Bearing... for higher speeds or long pregreased life... thin section race for simple press fit... runs directly on hardened shafts... unit construction for easy assembly... shaft-riding retainer.

Torrington Heavy Duty Needle Bearing... for use with thin section or split housing where extreme impact loads require heavy outer race... maximum shock resistance... full roller complement... unit construction.

Torrington Heavy Duty Roller Bearing... for combination of high speed, long pregreased life or shock resistance... roller stability provided by end-guiding... flange-riding retainer... unit design.

All of these types of bearings are available with inner races.

Only Torrington Makes All Four!

Torrington developed the Needle Bearing and its specialized variations. This breadth of experience assures impartial engineering recommendations based on specific application requirements. You can rely on Torrington to recommend the most compact and economical design compatible with operating conditions and performance requirements. Call on your Torrington representative for help in applying the right bearing in the right place. **The Torrington Company, Torrington, Conn.—and South Bend 21, Indiana.**

TORRINGTON BEARINGS

Every Basic Type of Anti-friction Bearing

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • NEEDLE ROLLERS • BALL • THRUST

New steels are born at Armco

Tank head (top), bracket (bottom), and control valves (center) illustrate the great workability of Armco ZINCGRIP.

Brady cuts costs, simplifies design, speeds assembly, improves performance with Armco ZINCGRIP Steel

Rust resistance of Armco ZINCGRIP® Steel helps water pressure tanks and controls manufactured by Brady Air Controls, Inc., Muncie, Indiana, provide the trouble-free service home owners want. Workability of this special hot-dipped, zinc-coated steel also means cost-cutting production advantages, especially in fabrication of air volume control valves.

ZINCGRIP replaces die-castings

Originally, valves were two cup-shaped die-castings, joined by bolts, with a diaphragm between them. Now halves are formed from ZINCGRIP Steel and the diaphragm inserted. Both parts are then securely locked together by a reverse draw that creates an airtight seal. Rust is sealed out, too, because ZINCGRIP's tight coating does not flake or peel despite this severe fabrication.

One ZINCGRIP valve replaces any of four die-cast models. It can be assembled faster, performs better and costs less than all those it replaces.

Offers savings

You, too, can cut costs and increase your product's sales power with Armco ZINCGRIP. Its zinc coating stays intact through severe working for many corrosion-resisting applications where more costly or hard-to-fabricate materials are now used. Mail the coupon today for more information.

ARMCO STEEL CORPORATION
1040 Curtis Street, Middletown, Ohio

Please send more information on Armco ZINCGRIP Steel

Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation

The Competitive Sixties!

We are on the threshold of a new decade variously described as the "Soaring Sixties," the "Fabulous Sixties," and the "Golden Sixties."

All the terms are appropriate, but we think the next ten years should also be called the "Competitive Sixties."

The facts are crystal clear, but too often some of them are obscured by our enthusiastic preoccupation with more babies, bigger markets, and the scientific marvels of the Space Age.

We can readily agree, of course, with the Census Bureau's estimate that the U. S. will have a population of 219.5 million by 1970. Thus in just ten years, the U. S. will have 42 million more people, or the equivalent of 20 cities the size of Pittsburgh.

It is equally apparent that by 1970 the U. S. will have 61 million families or 9 million more than it has today.

And, too, the $9 billion we are spending each year on research will result in scientific marvels beyond the comprehension of ordinary men.

But more people and more families do not necessarily mean bigger markets and a still higher standard of living. The poverty and disease ridden millions in Asian, African, and Latin American countries are eloquent examples.

In our country, we will want to keep on satisfying the needs of a growing population with ever higher standards of living.

The problems have become monumental, although not insurmountable.

The U. S. no longer has a monopoly on technical knowhow or productive capacity.

It no longer is competitive in the world market. To compete abroad, American companies are scurrying to establish foreign plants.

The result is a loss of plant capacity and jobs in America.

Here at home, too, markets are changing. For instance, people find they do not need a two-and-a-half-ton leviathan to drive to the drugstore for a package of cigarets. They are turning to the new compact cars and imports.

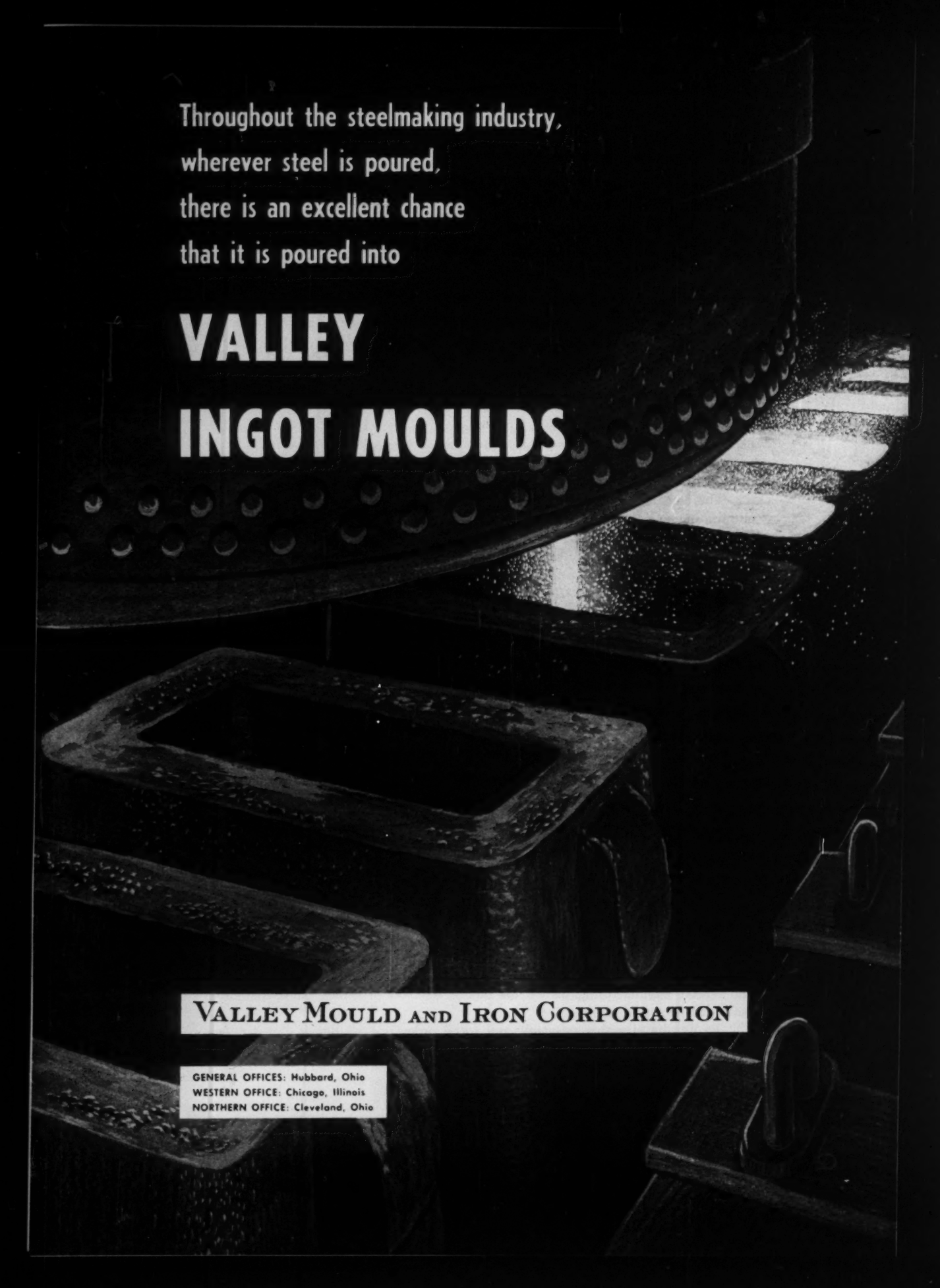
To those who are satisfied with things as they are, the outlook is dismal.

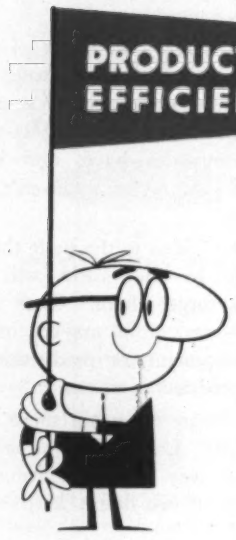
But we're not forgetting that the U. S. still has the most wealth, the finest and largest manufacturing plants, the largest reservoir of skilled labor, and unparalleled technical skills.

To us, the changing economic and social order is a challenge that can be met.

Irwin H. Such

EDITOR-IN-CHIEF


Throughout the steelmaking industry,
wherever steel is poured,
there is an excellent chance
that it is poured into
VALLEY
INGOT MOULDS
VALLEY MOULD AND IRON CORPORATION
GENERAL OFFICES: Hubbard, Ohio
WESTERN OFFICE: Chicago, Illinois
NORTHERN OFFICE: Cleveland, Ohio



How to Get It

HARRY THE HORSE was King of Beasts.

He could run faster and work better than any of his rivals—Mike the Mule and all the rest. But as time went on, Harry ate, rested, and argued about his inalienable rights so much that Mike began winning races and doing more of the work.

One day Harry ambled back to the barn after a pleasant nap in the sun, to find Mike in his stall.

"You are in my place!" shouted Harry.

"Nein!" Mike spoke with a Mulish accent. "This place is now mine."

Harry appealed to the court of the United Animal Kingdom, but the judges upheld Mike and crowned him King.

Moral: Uneasy should lie the head that wears the crown.

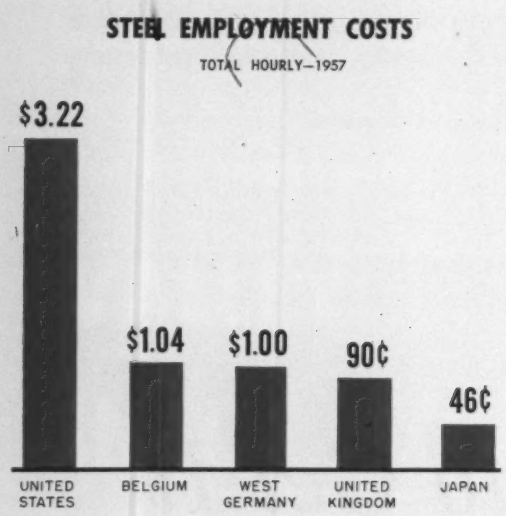
AMERICA is the leading industrial nation, but our crown is askew.

- Although the U. S. is the world's largest producer of thousands of metalworking products, it is experiencing record imports of autos, machine tools, radios, and many other products because of severe price competition from abroad. Example: In 1959, 4 million tons of foreign steel entered the U. S.—that's equal to the amount of finished steel which can be turned out in a good year by Armco Steel Corp. (Its employment is about 40,000.)
- Although the U. S. is renowned as an industrial democracy, it saw one American union keep 500,000 men on strike for 116 days in 1959 and cause layoffs for another half million in other industries, plus short weeks for countless more. The issue: Higher employment costs which are already three to eight times those overseas.
- Although the U. S. is famous for efficiency, it is wasting 25 per cent of its productive effort through featherbedding.
- Although the U. S. is reputed to be industrially progressive, it hobbles technological progress with depreciation laws that are the most archaic in the world. Capital recovery through depreciation requires 12 to 30 years compared with four to eight years in the industrial countries of Europe.

Those are only a few of the signs that America's industrial supremacy is being challenged. What to do about it?

Build tariffs and quotas to keep foreign goods out?

Few seriously propose such restrictions for the long pull because they can't work forever, and



they serve to perpetuate imbalances in our own economy.

Keep American wage rates closer to European scales?

Yes, that's a solution, but it won't come quickly. Nobody wants to reduce our pay—just slow down the increases so overseas rates can gradually catch up. Yet the steel strike is dramatic proof of how difficult it is to check the wage spiral, even in an industry that pays one of the highest scales anywhere in the world.

Cut out featherbedding?

Yes, it would help. But, again, the steel strike shows it's no easy matter. The major stumbling block to settlement has been the companies' insistence on a better union attitude toward the problem. The union denies that the difficulty even exists.

Reform our depreciation laws?

That, too, would help. The outlook for Congressional action is the most hopeful in years.

First Clue for Survival

American wage rates closer to European scales, reduced featherbedding, depreciation reform—all can help. But the greatest aid of all is self-help. You can achieve greater production efficiency through the better purchase and use of equipment.

How often do you review your equipment's efficiency?

"Every day," say Carl and Jack Wedler, owners of Wedler Bros. Inc., a Cleveland screw machine job shop. "We don't review everything daily, but some aspect of our machinery's capabilities gets a frequent look because production efficiency is what we sell."

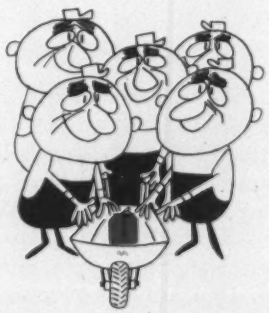
Three decades of depression, war, boom, recession, and inflation have convinced the brothers that "you'll get along all right if you learn to stick to the basics of business."

"Maybe the fundamentals bore a lot of people," says Jack Wedler. "We never swept the field with dazzling sales promotion. We never developed the most sensational new product since the wheel. Some companies have, and more power to them. The vast majority haven't, yet they usually make out."

Advises Carl Wedler: "Stick to the basic things. All the razzle-dazzle in the world will get you nowhere if you forget them. They vary for every company—marketing, maybe, or research, material management, or production efficiency. For us it's production efficiency."

Jack explains: "By that, we mean more than high labor productivity. Labor has to be efficient, sure. The best way to get efficiency is with good machinery. If we didn't keep up to date, we'd be goners."

Wedler has kept modern. It replaces about 10 per cent of its equipment yearly. In 1959, it spent $50,000, a remarkable sum when viewed in the light of its $600,000 annual sales. Another statistic is eloquent. In 1929, its capital investment per employee was practically nil. In

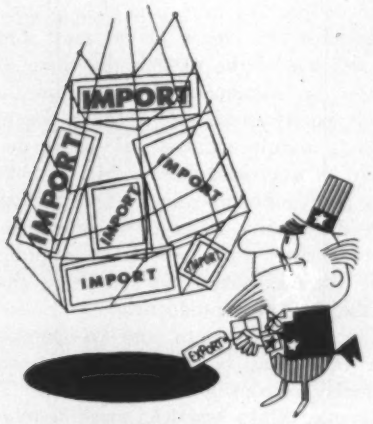


Featherbedding wastes 25 per cent of U. S. effort

1939, it was $1000; in 1949, $7000; in 1959, $10,000.

"For 30 years, we've been selling our strongest asset, our machinery's capabilities," says Carl. "It makes sense to develop that asset."

"I'll make two bets," says Jack. "First, I'd guess that most business failures can be traced



Imports of many products are at peaks

to failure to concentrate on the basic. Selling's important; service is important. But production efficiency comes ahead of everything else for us. My second bet is that most other companies are primarily dependent on production efficiency too."

Jack Wedler is probably right. Yet if he is, the majority of metalworking companies don't realize their dependency on equipment. Only 33 per cent of 7500 metalworking plants surveyed by STEEL plan to buy new machinery to expand capacity in 1960. Those 2500 who told us they would buy are practically unanimous in saying you must do it annually.

"You have to stay on top of the problem (keeping equipment modern) all the time or your troubles will become overwhelming," says C. A. Woodley, executive vice president of Caterpillar Tractor Co., Peoria, Ill. "In a poor profit year, you may have to curtail spending, but even then you should try to take care of the most urgent situations."

Good profits are forecast for 1960, and metalworking will spend $5.65 billion on capital equipment compared with $4.57 billion in 1959. Yet metalworking needs to spend $20.7 billion, executives tell us. They would do so if they had unlimited funds.

So metalworking faces a $20 billion challenge to keep its facilities up to the minute.

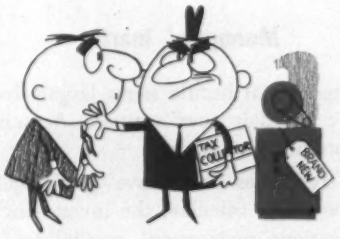
How would the latest equipment benefit you?

"For one thing, it would go a long way toward solving many of our problems," say the Wedlers. "Take price competition (67 per cent of metalworking firms tell STEEL that the domestic and foreign varieties are their No. 1 headache). With the best equipment, we could meet or beat practically any price except from those competitors whose wage rates are much lower than ours. And in our experience, the fellows with the low wage rates hardly ever have the best equipment. We could even meet or beat most of them."

A New England machine tool builder who has been hard hit by imports points out: "That is one of the best answers to this competition with low foreign wage rates. I grant that foreign facilities are improving in quality, but American equipment users still have better machinery available to them and more financing at their disposal. The tragedy is that we don't exploit our natural advantages. It seems to me that we've been spending so much time worrying about low pay scales abroad that we're forgetting the ammunition right at hand."

The $15 billion gap between what metalworking should spend and what it will spend in 1960 gives an idea of the ammunition that's unused. Until it is exploited, problems like foreign competition will grow more acute.

Even when the Europeans and Japanese pay more for their materials and transportation than we do, they can undersell us with ease because of the wage gap. German makers of barbed wire sell their products in Pittsburgh for about $40 a ton less than wire made in Donora, Pa., which is only 21 miles from Pittsburgh. The Japanese, using premium price American scrap, can undersell American producers of reinforcing bars by as much as $20 a ton.



Tax depreciation policies thwart modernization

Compare these foreign auto prices (at New York) with those of American models, including the new compacts: Simca Aronde (France) $1575; Fiat 600 (Italy) $1298; Renault Dauphine (France) $1645; Volkswagen (West Germany) $1545. As recently as 1951, annual imports of cars and trucks came to less than 25,000 units. The figure will hit at least 600,000 (perhaps 700,000) in 1960. Our exports are slipping.

It means we're also losing jobs. Between 1954 (when imports began to soar and exports started

to nose dive) and 1958, we have lost more than 66,000 jobs (directly) in steel, autos, and machine tools alone.

As Ralph E. Cross, executive vice president of the Cross Co., Detroit, points out: "Industry must invest $40 billion annually in plants and machinery to maintain the jobs that are in existence today and to provide jobs for the 400,000 to 500,000 people entering the labor force each year. Every existing job requires an annual investment of $450 just to keep it going."

The First National City Bank of New York estimates that manufacturing companies have an average capital investment of $20,000 per employee.

Besides providing for jobs, capital investment improves present jobs by making them more productive and better paying. In the long run, the benefits can lead to improved labor relations. Inadequate capital spending may be one of the underlying causes of poor labor relations.

Greater production efficiency is also the antidote to inflation that has boosted consumer prices 23.6 per cent since 1949. The highly mechanized coal industry, for example, sells its product at only 16.6 per cent more than it charged in 1949 despite an 83.4 per cent wage increase.

If exploiting the advantage of equipment modernization can bring so many benefits, why isn't more of it done?

Workers' featherbedding doesn't help. Neither do federal policies on depreciation. Another difficulty is managers' inertia.

Managers' Inertia

The managerial hurdle stems largely from the "we can't afford it now" attitude. Actually, you can't afford not to re-equip.

Most companies that have good equipment buying programs calculate the investment return on the various replacement possibilities. "Rank them according to their rate of return," suggests Caterpillar Tractor's Mr. Woodley. "Then buy what you can afford." Often, the investment return is so attractive that it pays to borrow money if you can't get it from your depreciation reserve or profits. If you can't borrow, investigate the financing or leasing plans many equipment builders offer, advise the more successful machinery buyers.

But above all, they say, systematize your buying. The catch-as-catch-can approach will leave you like a man trying to go up on a down escalator. Caterpillar requires quarterly forecasts of equipment spending from each of its plants.

A problem in bigger plants may sometimes be to sell one of the men in the chain of command on an equipment idea. Perhaps the proposal is poorly presented. Perhaps the man to be sold is unduly cautious. "If selling the management is a problem," says Mr. Woodley, "it shows poor communications. Top managers of any good company are eager for proposals. Their task is to run the company at a profit, and they're always looking for anything that can make the plant more productive."

Better communications and co-operation between equipment builders and users are also managerial responsibilities. Caterpillar Tractor, for example, thinks American machine tool builders are gadget happy. "We don't need all the automatic controls," complains Mr. Woodley. But he admits that his own people like them and that the job is partly to persuade the equipment users that all the gadgets aren't necessary.

Needed, too, is more rapport on engineering. Should the machinery builder do all of it, particularly on special jobs? The overwhelming consensus among users is that builders should pay for engineering, but is it fair in all cases? Better communications and co-operation between the user and builder may resolve some of those questions—and get better engineering.

The same is true for research. More is needed by both parties to develop better machinery. Convair Div. of General Dynamics Corp. experimented with explosive forming for its own use and came up with Dynapak. The machine (now available commercially) promises to blast new trails in metal forming.

Second Clue for Survival

The opportunity to improve production efficiency is only one of the advantages American managers enjoy over their foreign competitors.

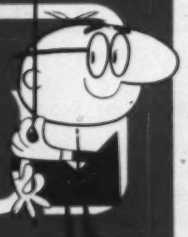
We also hold an edge in materials—their quality, their quantity, their variety. We're ahead in other ways, but those two stand out.

STEEL's 1960 Program for Management (to start in the issue of Jan. 11) will concentrate on showing how metalworking can best keep and improve those advantages to retain America's industrial supremacy now threatened from abroad.

• *An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.*

1960

WHAT METALWORKING MANAGERS EXPECT

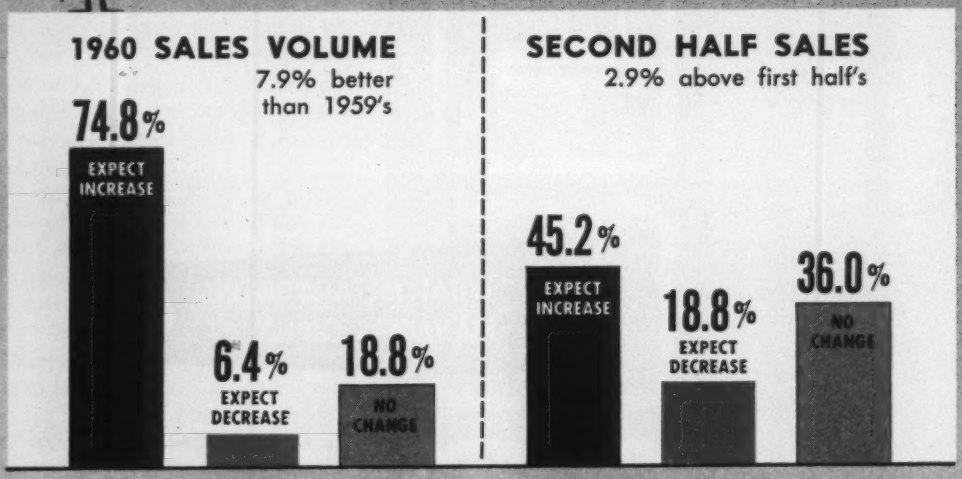


A Banner Year Ahead

STEEL's editors have found that one of the best indicators of the business trend in metalworking is the forward thinking of the men who manage the plants. So STEEL asked 7500 general managers of metalworking plants what they expect in 1960 — in production, prices, profits, costs, employment, capital expenditures, major problems. Their answers will assist you in your planning.

WHAT METALWORKING MANAGERS EXPECT

1960 Sales to Jump 7.9%



SALES INCREASES EXPECTED

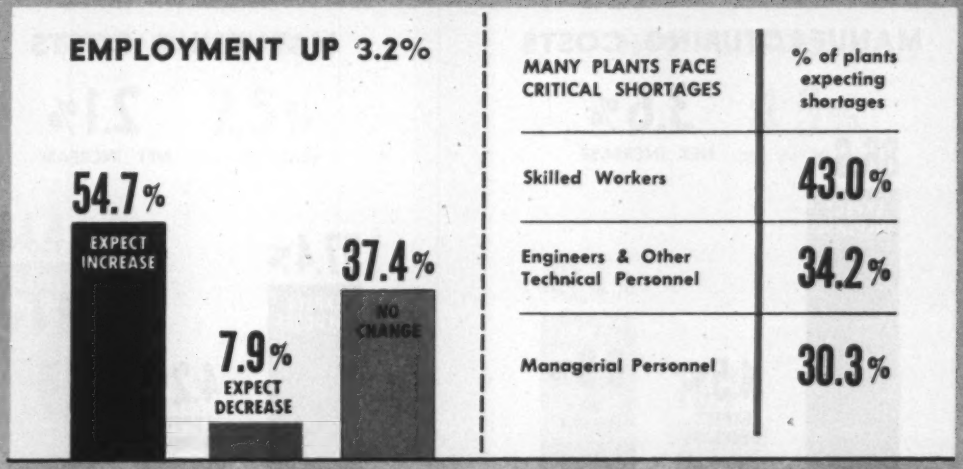
ANALYSIS BY INDUSTRY GROUPS:	1960 vs. 1959	2nd half vs. 1st half
Primary metals (S.I.C. 33)	8.0%	0.5%
Fabricated metal products (S.I.C. 34)	7.0%	2.9%
Machinery, except electrical (S.I.C. 35)	8.0%	1.6%
Electrical machinery (S.I.C. 36)	9.2%	3.4%
Transportation equipment (S.I.C. 37)	7.1%	2.3%
Instruments, related products (S.I.C. 38)	8.4%	5.7%
Other metalworking (S.I.C. 19, 25, 39)	9.6%	8.2%
BY SIZE OF PLANTS:		
Employing 20-99	7.9%	2.1%
Employing 100-499	8.1%	4.0%
Employing 500 or more	7.4%	2.5%

THIS IS THE YEAR the fuse will be lighted for the biggest boom in metalworking's history. The industry's dollar sales in '60 will shoot about 8 per cent above the 1959 level. The second half will be better than the first.

- Net profits will rise 4.5 per cent.
- Manufacturing costs will continue to climb, as unions maintain their pressure for wage increases.
- Marketing costs will rise, as metalworking sharpens its attack in the contest for the bigger markets of the soaring sixties.
- Selling prices will be lifted 2.5 per cent.
- Employment will be more than 3 per cent higher.
- More dollars will be poured into research and development. And more than half the nation's metalworking plants will introduce new products.
- Production capacity will be boosted 4.5 per cent.
- Export markets will be tougher to crack.
- Defense production will inch up.
- Efficiency in production will be a prime goal.

That's the consensus of the nation's plant managers who participated in STEEL's annual survey of business expectations.

Employment Up; Shortages Severe



MANY PLANTS FACE CRITICAL SHORTAGES	% of plants expecting shortages
Skilled Workers	43.0%
Engineers & Other Technical Personnel	34.2%
Managerial Personnel	30.3%

ANALYSIS BY INDUSTRY GROUPS:	Employment increase expected	Percentage Expecting Shortages — Of skilled workers	Of technical personnel	Of managerial personnel
Primary metals (S.I.C. 33)	2.4%	36.8	27.6	28.7
Fabricated metal products (S.I.C. 34)	2.4%	39.7	26.7	27.6
Machinery, except electrical (S.I.C. 35)	3.5%	48.5	38.5	32.4
Electrical machinery (S.I.C. 36)	4.3%	44.5	48.4	32.9
Transportation equipment (S.I.C. 37)	4.8%	43.1	34.9	31.4
Instruments, related products (S.I.C. 38)	4.3%	48.9	46.9	30.8
Other metalworking (S.I.C. 19, 25, 39)	3.4%	38.3	26.7	28.8
BY SIZE OF PLANTS:				
Employing 20-99	3.4%	45.5	28.7	25.2
Employing 100-499	3.2%	41.1	37.7	35.6
Employing 500 or more	2.5%	38.8	44.1	34.2

It signals record sales and profits for metalworking. But this year also promises to bring a record number of headaches to the metalworking manager. He foresees critical shortages of manpower, materials, and money. His company's markets are threatened by foreign competitors whose low wage costs give them a decisive price advantage. Domestic price competition is severe on most product fronts (60 per cent of the managers say this is their No. 1 problem). High—and mounting—wage costs make it imperative that the manager search for ways to improve production efficiency. Government foot dragging on depreciation reform deters many managers from buying all of the modern, efficient equipment they need.

• **A Record Year**—Nearly 3 out of 4 managers replying to this year's confidential questionnaire expect their 1960 dollar sales to be higher than those of 1959. Only 6.4 per cent foresee declines.

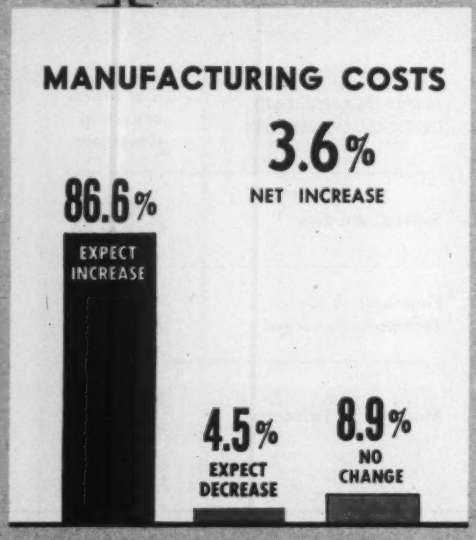
The respondents predict an improvement of 7.9 per cent over last year's estimated $145 billion volume of metalworking sales. So a record $156.5 year is a good bet.

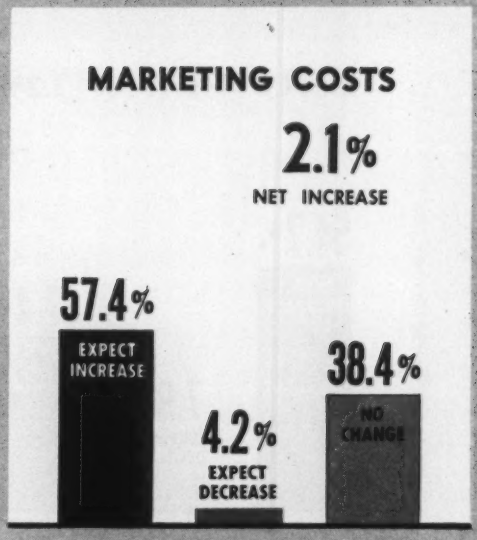
• **Who'll Gain Most**—Most optimistic are manufacturers of electrical machinery and equipment—they predict a 9.2 per cent sales increase. That would give them a $25 billion year in '60.

Expecting an 8.4 per cent sales boost are manufacturers of instruments and related products. It

WHAT METALWORKING MANAGERS EXPECT

Costs Keep Climbing . . .





ANALYSIS BY INDUSTRY GROUPS:	Increase Expected
Primary metals (S.I.C. 33)	4.0%
Fabricated metal products (S.I.C. 34)	3.5%
Machinery, except electrical (S.I.C. 35)	3.9%
Electrical machinery (S.I.C. 36)	3.1%
Transportation equipment (S.I.C. 37)	3.6%
Instruments, related products (S.I.C. 38)	3.5%
Other metalworking (S.I.C. 19, 25, 39)	3.5%
BY SIZE OF PLANTS:	
Employing 20-99	3.8%
Employing 100-499	3.5%
Employing 500 or more	3.2%

ANALYSIS BY INDUSTRY GROUPS:	Increase Expected
Primary metals (S.I.C. 33)	2.0%
Fabricated metal products (S.I.C. 34)	2.1%
Machinery, except electrical (S.I.C. 35)	2.0%
Electrical machinery (S.I.C. 36)	2.3%
Transportation equipment (S.I.C. 37)	2.0%
Instruments, related products (S.I.C. 38)	3.0%
Other metalworking (S.I.C. 19, 25, 39)	2.0%
BY SIZE OF PLANTS:	
Employing 20-99	2.2%
Employing 100-499	2.0%
Employing 500 or more	2.1%

would lift their sales near the $4.5 billion mark.

Expected production of nearly 7 million automobiles in 1960 will be the heftiest factor in the transportation equipment industry's expected 7.1 per cent hike in dollar sales. It would give the industry a volume in excess of $42 billion.

Primary metal producers look for an 8 per cent gain in dollar volume. More than 95 per cent of the respondents in this category expect their '60 sales to equal or exceed those of 1959. It signals a $29.2 billion year.

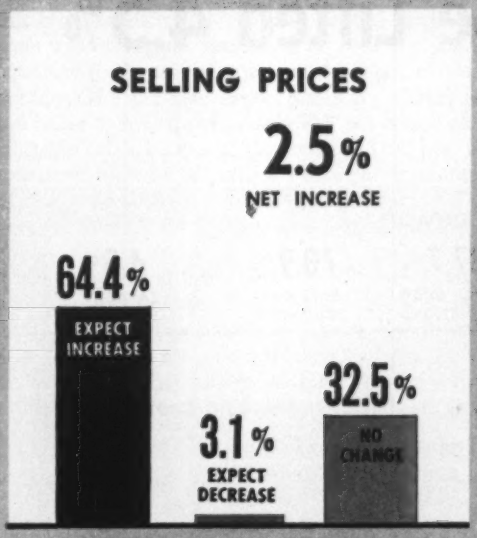
Makers of fabricated metal products look for the smallest increase of any category surveyed—7 per cent. But that will give the industry a walloping $22.2 billion volume for the year.

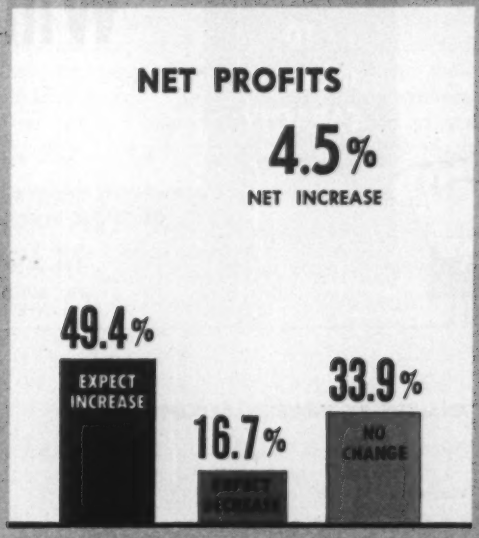
Nonelectrical machinery manufacturers expect an 8 per cent sales gain. Nearly 95 per cent look for their '60 sales to equal or exceed those of '59. It'll give them a $31 billion year.

Also anticipating large sales advances are makers of metal furniture, sporting goods, and musical instruments.

• **Better Profits, but**—More than 8 in 10 of the managers expect their 1960 aftertax profits to equal or exceed those of 1959. But they don't expect profit improvements commensurate with sales gains. Managers of small plants are especially pessimistic; they expect only a 3.1 per cent profit advance on a 7.9 per cent increase in sales. The two reasons cited

Prices and Profits Will Rise





ANALYSIS BY INDUSTRY GROUPS:	Increase Expected
Primary metals (S.I.C. 33)	2.6%
Fabricated metal products (S.I.C. 34)	2.6%
Machinery, except electrical (S.I.C. 35)	2.7%
Electrical machinery (S.I.C. 36)	1.5%
Transportation equipment (S.I.C. 37)	2.5%
Instruments, related products (S.I.C. 38)	2.0%
Other metalworking (S.I.C. 19, 25, 39)	2.1%
BY SIZE OF PLANTS:	
Employing 20-99	2.6%
Employing 100-499	2.4%
Employing 500 or more	2.0%

ANALYSIS BY INDUSTRY GROUPS:	Increase Expected
Primary metals (S.I.C. 33)	5.2%
Fabricated metal products (S.I.C. 34)	4.1%
Machinery, except electrical (S.I.C 35)	4.3%
Electrical machinery (S.I.C. 36)	7.1%
Transportation equipment (S.I.C. 37)	2.8%
Instruments, related products (S.I.C. 38)	4.5%
Other metalworking (S.I.C. 19, 25, 39)	3.8%
BY SIZE OF PLANTS:	
Employing 20-99	3.1%
Employing 100-499	5.9%
Employing 500 or more	6.0%

most frequently: Soaring employment costs and severe price fighting. Higher state and local taxes also are blamed.

• **Costs Head Higher**—The managers believe their unit manufacturing costs will climb another 3.6 per cent; they look for sales and distribution costs to rise 2.1 per cent. Paradox: Primary metal producers foresee the biggest hike in manufacturing costs (4 per cent) and the smallest hike in marketing costs (2 per cent), while electrical machinery makers anticipate the narrowest rise in manufacturing costs (3.1 per cent) and the second largest increase in marketing costs (2.3 per cent).

• **Pushed by Wages**—About 8 in 10 plants expect their unit wage costs to increase this year. More than 3 in 4 expect to pay higher wages; 1 in 5 looks for more overtime work; about 1 in 10 foresees lower productivity. In contrast, only 3.4 per cent expect employee productivity to rise. The prediction accentuates the need for managers to find ways to obtain greater production efficiency.

• **Strike Worries Many**—Many of the respondents fear a resumption of the steel strike after the "cooling off period." They almost unanimously back steel management's stand in the dispute, although some think the industry did a lousy job of selling its position to the public. Others suggest "remedies"

WHAT METALWORKING MANAGERS EXPECT

Production Capacity Will Be Lifted 4.5%

46.9% EXPECT TO INCREASE CAPACITY

OF THOSE WHO'LL HIKE CAPACITY . . .

	14.3% WILL BUILD PLANTS	37.7% WILL BUILD ADDITIONS	70.9% WILL BUY EQUIPMENT	4.5% CAPACITY INCREASE
ANALYSIS BY INDUSTRY GROUPS:				
Primary metals (S.I.C. 33)	5.6%	38.6%	72.1%	4.5%
Fabricated metal products (S.I.C. 34)	6.4%	40.0%	70.6%	4.0%
Machinery, except electrical (S.I.C. 35)	3.1%	38.8%	71.8%	3.2%
Electrical machinery (S.I.C. 36)	1.2%	31.1%	79.1%	8.5%
Transportation equipment (S.I.C. 37)	8.7%	40.9%	67.7%	4.1%
Instruments, related products (S.I.C. 38)	1.0%	38.9%	57.4%	4.5%
Other metalworking (S.I.C. 19, 25, 39)	9.4%	31.6%	60.1%	4.7%
BY SIZE OF PLANTS:				
Employing 20-99	12.9%	30.6%	72.0%	5.1%
Employing 100-499	13.8%	43.0%	68.6%	4.1%
Employing 500 or more	19.4%	45.6%	73.6%	2.8%

for such labor problems. These comments are typical:

"Union bosses' unrealistic and irresponsible approaches to long range economic growth is the toughest problem facing the U. S. today"—Midwestern magnetmaker.

"Our biggest national problem is to work out some way of limiting wage increases to gains in productivity so that we can stop inflation by holding costs and prices steady"—Manufacturer of circuit breakers.

"If we don't stop inflation by limiting wage increases to productivity improvements, Nikita Khrushchev will be more right than wrong in saying that he 'will bury us someday' "—Vice president of Iowa metalworking company.

"Labor negotiations should be exposed to the public via television"—Automotive supplier.

"It's too bad that the steel industry didn't do a better job of informing the general public of the seriousness of foreign competition"—Producer of hydraulic components.

"The government should outlaw industry-wide strikes"—Gray iron foundry manager.

"We hope the present trend toward all-out efforts aimed at recapturing management rights is continued"—Container manufacturer.

"The steel industry is fighting a battle for all of us"—Gas heating equipment maker.

"A fact finding board, not appointed by the government, should be set up about a year in advance of any labor contract expiration. Its findings should be made public"—Tankmaker in the Far West.

"Unions should be made subject to the antitrust laws"—Gearmaker.

"I hope the steel industry holds out in its fight against featherbedding. Being without steel for a little while is tough, but being without profit for

a long while due to labor's greediness is even worse" —Manager of a screw machine products firm.

Many respondents mention upcoming labor negotiations in the railroad and trucking industries as potential blots on their '60 business pictures.

• **A Year of Shortages**—A rare plant in 1960 will be one that has all the manpower, materials, and money it needs: 17.4 per cent of the plant managers expect capital shortages to hold up planned expansions; 43 per cent expect shortages of skilled workers; 34.2 per cent expect shortages of engineers and other technical personnel; 30.3 per cent look for shortages of managerial personnel; 31.4 per cent anticipate material shortages (29.5 per cent foresee shortages of steel; 2.3 per cent, of copper; 0.9 per cent, of aluminum; 0.1 per cent, other materials).

• **Money**—Several firms report they'll turn to equipment leasing because of the tight money problem; others say they'll just have to "make do with what we've got." But the majority plan to keep hunting for financing; they recognize the need for greater production efficiency and believe they can get it by investing in modern equipment.

• **Materials**—Most look for steel to be in plentiful supply by the second quarter; they don't expect another long walkout after the "cooling off period." But until then, many say operations will be curtailed.

• **Manpower**—To beat the manpower shortage, companies are concentrating on four areas: 1. Holding onto the good men they have. 2. Finding new sources of supply (technicians, women, and older workers are mentioned). 3. Stepping up their recruiting programs. 4. Developing better training programs.

The manpower shortage is posing many problems. Two that are mentioned frequently: 1. Raiding. "We are forced to devote considerable effort to the warding off of other companies' attempts to hire our top people," laments an instrument maker. 2. Added costs. "The shortage of skilled workers raises our costs of inspection and instruction to maintain quality," complains a producer of textile machinery.

• **Price Cutting Is Severe**—STEEL asked the plant managers to rank their most serious problems: 6 in 10 named price competition as No. 1. "We've lost many contracts to competitors who must have quoted below cost," reports a hoistmaker. "In our area, fabricated structural steel is selling at lower prices today than at any time since before World War II," asserts a Mississippi fabricator. "Price cutting is forcing us to diversify out of the steel fabrication business," says another fabricator. "We're selling at cost and being undersold," mourns a wire goods manufacturer. "Many companies in this industry obviously don't know their true costs," asserts a Michigan tool and die maker.

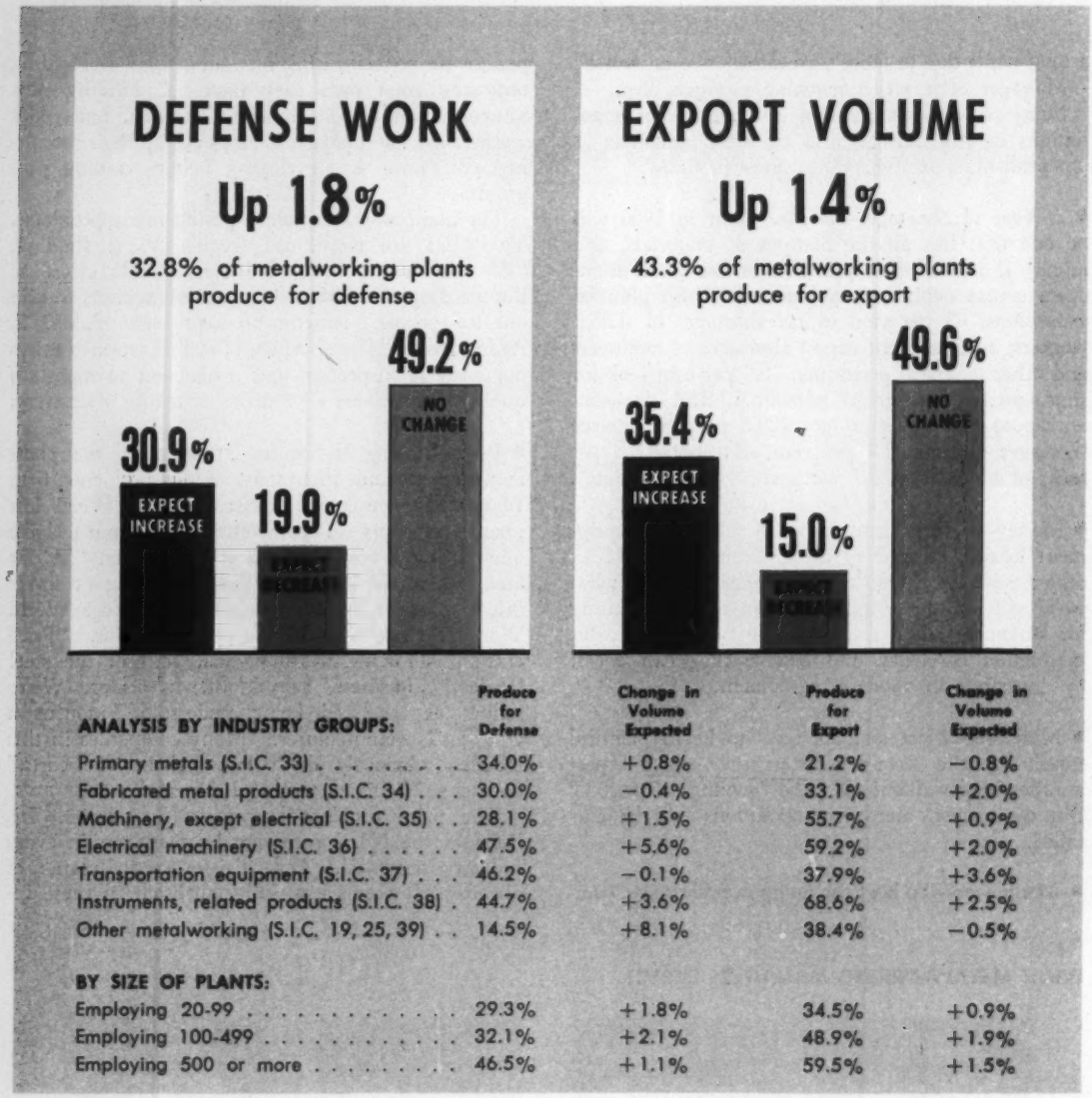
The price problem knows no boundaries. It's listed as the No. 1 sore spot by managers in every industry surveyed. And it's severe in plants of all sizes. It seems especially cutthroat in these in-

WHAT METALWORKING MANAGERS EXPECT

CAPITAL SHORTAGES	MATERIAL SHORTAGES	RESEARCH & DEVELOPMENT	NEW PRODUCTS
will hold up expansions for	will curtail production for	spending will rise	will be introduced by
17.4%	31.4%	2.9%	56.8%

ANALYSIS BY INDUSTRY GROUPS:	Expect Capital Shortages	Expect Material Shortages	R & D Spending Increase	Expect to Introduce New Products
Primary metals (S.I.C. 33)	9.0%	16.5%	2.1%	35.3%
Fabricated metal products (S.I.C. 34)	19.7%	39.4%	1.8%	51.1%
Machinery, except electrical (S.I.C. 35)	18.4%	31.8%	3.0%	63.3%
Electrical machinery (S.I.C. 36)	14.8%	23.8%	5.2%	72.3%
Transportation equipment (S.I.C. 37)	17.6%	43.4%	4.0%	50.9%
Instruments, related products (S.I.C. 38)	13.2%	11.1%	4.0%	83.2%
Other metalworking (S.I.C. 19, 25, 39)	24.4%	31.0%	2.6%	58.3%
BY SIZE OF PLANTS:				
Employing 20-99	22.4%	31.2%	2.0%	50.0%
Employing 100-499	14.2%	33.1%	3.3%	61.1%
Employing 500 or more	8.4%	27.6%	5.1%	69.5%

WHAT METALWORKING MANAGERS EXPECT



ANALYSIS BY INDUSTRY GROUPS:	Produce for Defense	Change in Volume Expected	Produce for Export	Change in Volume Expected
Primary metals (S.I.C. 33)	34.0%	+0.8%	21.2%	−0.8%
Fabricated metal products (S.I.C. 34)	30.0%	−0.4%	33.1%	+2.0%
Machinery, except electrical (S.I.C. 35)	28.1%	+1.5%	55.7%	+0.9%
Electrical machinery (S.I.C. 36)	47.5%	+5.6%	59.2%	+2.0%
Transportation equipment (S.I.C. 37)	46.2%	−0.1%	37.9%	+3.6%
Instruments, related products (S.I.C. 38)	44.7%	+3.6%	68.6%	+2.5%
Other metalworking (S.I.C. 19, 25, 39)	14.5%	+8.1%	38.4%	−0.5%
BY SIZE OF PLANTS:				
Employing 20-99	29.3%	+1.8%	34.5%	+0.9%
Employing 100-499	32.1%	+2.1%	48.9%	+1.9%
Employing 500 or more	46.5%	+1.1%	59.5%	+1.5%

dustries: Foundry, screw machine product, fastener, structural steel fabricating, instrument, nonelectrical machinery.

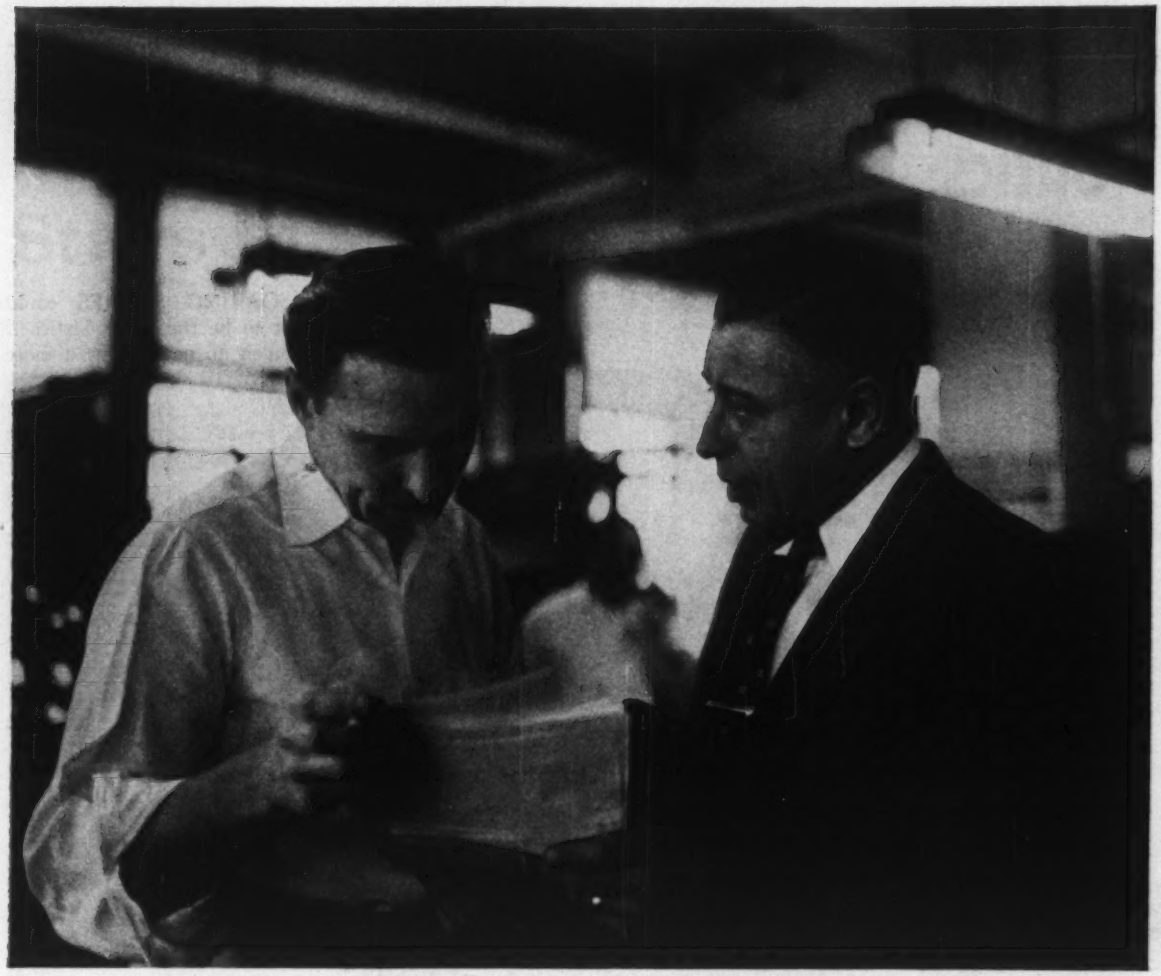
• **Inflation**—The managers predict that their selling prices will rise an average of 2.5 per cent this year. About 2 in 3 expect to hike their quotations. The largest increase (2.7 per cent) is predicted by makers of nonelectrical machinery; the smallest boost (1.5 per cent) is anticipated by producers of electrical machinery and equipment (see table on Page 101).

The managers blame runaway employment costs for the inflationary spiral.

• **Depreciation Difficulty**—The need for federal tax reform to permit more realistic recovery of capital invested in plant and equipment is ranked as Problem No. 4 by the plant managers. More than 1 in 4 of them list it among the three most serious problems of the year. Most of them figure it is a worse detriment than tight money, foreign competition, or general tax policies. Many plan to bombard their congressmen with letters pointing out the need for depreciation reform.

• **Competition from Abroad**—A hefty percentage of the managers list foreign competition as the most serious issue confronting them. They expect importers to grab away an even larger part of their markets this year than last. Domestic manufacturers will counter with improved service, new designs, stronger marketing, greater reliability. But they point out that the only sure way to regain a competitive position is to hold wages in line until foreign countries narrow the gap in labor costs.

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.



"Yesterday this shop racked up a $423 loss!"

The foreman's bewildered. How can the Plant Manager be so sure? Even in a small shop like this one, you don't get *that* kind of information in 24 hours!

The Plant Manager never thought so, either. Today he knows different. He's got yesterday's down-time figures right in front of him. There's a loss all right. But he knows where—and why. And most important, he knows now that he's equipped to prevent its happening again.

How did the Plant Manager get such fast, reliable information? With Automatic Keysort Data Processing. Instead of the late or inadequate reports he *used* to get, Automatic Keysort now gives him an accurate breakdown of each day's labor costs *by the following afternoon.* Keeping abreast of things as they happen, he can correct money-losing situations *in time* . . . can keep production flowing on a profitable level.

Automatic Keysort's easy-to-use machines and punched cards require no specialized personnel, no restrictive procedures. Designed to fit your business as it stands and as it grows, Automatic Keysort will give you all the fast, accurate information you need for modern management control of every factory operation. And at remarkably low cost.

To learn more about how Automatic Keysort Data Processing can fulfill *your* need for timely, comprehensive facts and figures, call your nearby Royal McBee Data Processing Representative, or write Royal McBee Corporation, Data Processing Division, Port Chester, New York for brochure FS-33.

ROYAL McBEE · *data processing division*

NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

Politics: Business' Big Challenge

Commerce Secretary F. H. Mueller recommends . . .

A Businessman's Program for Action in Politics This Presidential Election Year

1. **Do deeper thinking on public questions.**
   "This means doing the homework first, before shooting from the hip with stereotyped ideas."

2. **Speak up oftener on vital issues.**
   "Let's hunt opportunities to be more vocal . . . write letters, circulate printed material, make speeches, give press interviews, face radio-TV panels, testify at hearings, brief congressmen, telephone governors, buttonhole mayors, and stand up in town meetings."

3. **Play a bigger role in public affairs.**
   "Business insight and talent are urgently needed to help better the business climate of a community."

4. **Encourage more political action by young people.**
   "Recruit them early in the defense of free enterprise. Junior executives should be given leaves of absence to serve in public office."

THE SOARING SIXTIES could turn out to be the Sorry Sixties if businessmen do not assume a more active part in national politics, warn Washington observers.

Among many danger signs, these stand out:

1. The rising tide of antibusiness sentiment in Washington.

2. The clamor for labor-management relations legislation.

3. The controversy over foreign relations which involves the import problem and overseas development projects.

Commerce Secretary Frederick H. Mueller (left) sums up the challenge this way: Business growth in the sixties will be as dependent upon what happens in Washington as upon technological development and population increases.

Antibusiness Sentiment

You can see the drift of the times in the antibusiness thinking in Washington. The prolabor bias is disappearing, but it is becoming proconsumer. Business is being attacked from a different angle.

Take the investigation of the drug industry by Sen. Estes Kefauver (D., Tenn.). Statements like "drug manufacturers reap profits of 1000 per cent" will stick in the public mind—whether they are true or false. No one has stepped forth to explain fully the role of profits in research and development.

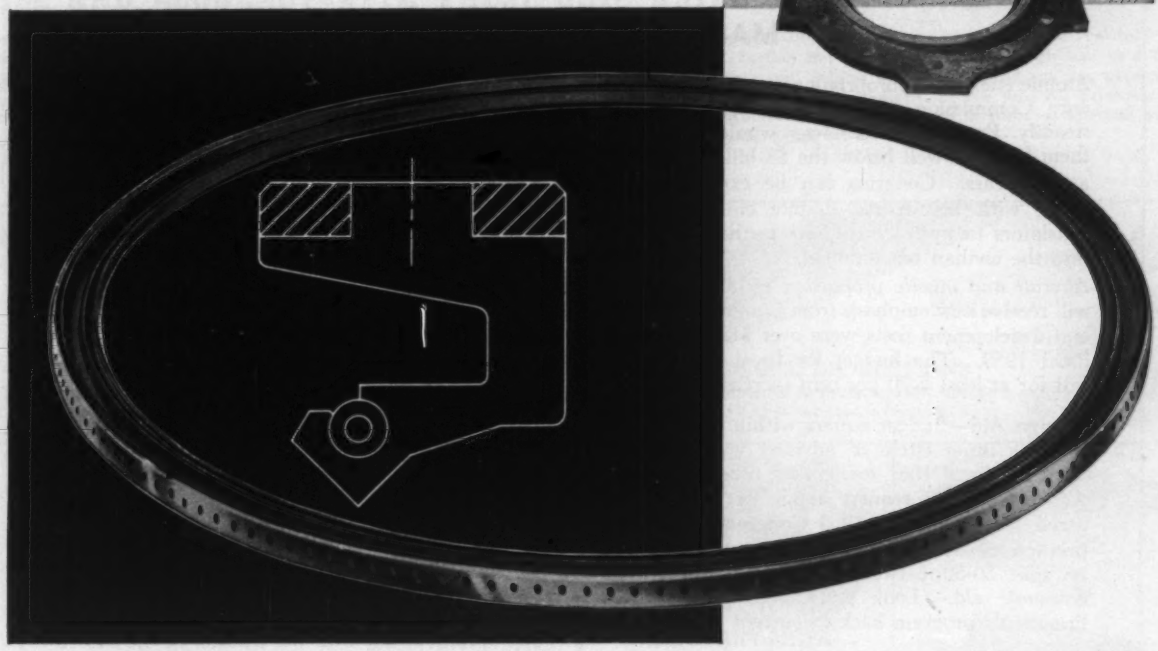
As metalworking knows, the senator also operates in other fields. In 1960 he will take another crack at the steel industry. He has promised an investigation of any steel price boosts and has hinted at a look into pricing policies.

Senator Kefauver has also called for a consumer's representative on the President's cabinet.

Other legislators are ready to

Goes in: *1 minute or less*

Stays in: *6 months or more*



It's Flex-i-Band© – new roll neck seal by C/R

Those are the facts, straight from a hot mill of one of the nation's foremost steel producers. Install this seal in one minute or less, forget it for 6 months or more in rugged hot mill service — much, much longer on cold mill jobs.

More facts: Chicago Rawhide's new Flex-i-Band Seal will not spin in the bore. See that steel O.D.? That's why. It holds the seal tightly in the bore with sure metal-to-metal contact. And the rubber, molded into the perforations cannot shear its bond.

So when your roll necks turn up as high as 5000 surface f.p.m. and the oil side gets hot, you need minimum-wear, maximum life seals to keep out steam, water and scale and keep oil in. Put in C/R Flex-i-Bands the next time you pull the chocks. They go in fast—and *stay in.* Ask your C/R Representative or write us direct.

More automobiles, farm and industrial machines rely on C/R oil seals than on any similar sealing device.

CHICAGO RAWHIDE MANUFACTURING COMPANY
1245 ELSTON AVENUE • CHICAGO 22, ILLINOIS

Offices in 55 principal cities. See your telephone book.
In Canada: Manufactured and Distributed by Chicago Rawhide Mfg. Co. of Canada, Ltd., Brantford, Ontario.
Export Sales: Geon International Corp., Great Neck, New York

C/R PRODUCTS: C/R Shaft and End Face Seals • Sirvene (synthetic rubber) molded pliable parts • Sirvis-Conpor mechanical leather cups, packings, boots • C/R Non-metallic Gears

Copyright 1958 by Chicago Rawhide Manufacturing Company

OIL SEAL C/R DIVISION

CHICAGO RAWHIDE

The Legislative Outlook for 1960*

*When the second session of the 86th Congress reconvenes Wednesday (Jan. 6), legislators take up where they left off Sept. 15 at the close of the first session. Bills in committee or passed by one house retain their status.

MAJOR APPROPRIATIONS

Atomic energy—Appropriations to the Atomic Energy Commission have been rising slowly but steadily. President Eisenhower would like to see them level off well below the $3 billion mark for a few years. Congress can be expected to go along with his wishes, despite efforts of some legislators to push Uncle Sam farther and faster into the civilian reactor field.

Aircraft and missile propulsion by atomic energy will receive new emphasis from Congress. Research and development costs were over $100 million in fiscal 1959. The budget for fiscal 1961 should call for at least a 20 per cent increase.

Foreign Aid—Budget cutters within the administration's inner circle of advisers wanted Ike to slash the fiscal 1961 foreign aid program, but he will most likely request about $4 billion compared with the fiscal 1960 Congressional appropriation of $3.2 billion. The new budget will be split 50-50 between military assistance and economic aid. Look for Congress to cut the President's program back to current levels.

National Security—Defense Department spending will be held to the $41 billion level named as a ceiling by the President. But shifts within the Pentagon's budget will affect metalworking significantly.

The Air Force, for example, will be asking for funds to put the Strategic Air Command on an air alert basis. Depending upon how many planes are put into the air for how long, the cost could range up to $1 billion. Presumably, that money would have to come from hardware accounts, if no large manpower cut is made. Programs most likely to be cut back include the B-58, most Naval shipbuilding programs, and Army modernization.

The Navy will continue to emphasize the atom powered, Polaris firing submarine and will seek additional funds to build up its antisubmarine warfare capability. It probably won't get another large aircraft carrier.

The Army's big program for the Nike Zeus antimissile will still be held short of full scale production. Its modernization program remains on a prototype basis.

Space—The National Aeronautics & Space Administration is likely to get $1 billion from Congress, whether the administration requests that amount or not. That is double the fiscal 1960 appropriation, but with the transfer of the Saturn big booster program from the Army to NASA, the net gain in the nation's space effort is much less than $500 million. Spending by the space agency in fiscal 1961 will remain well below the new obligational authority level because many programs are not far enough along to utilize all available funds.

(*Please turn to Page* 112)

vote for antimerger legislation under the leadership of Rep. Emanuel Celler (D., N. Y.).

Another example of proconsumer thinking:

Some people are asking for advance notification of price increases in basic industries (or those with a high percentage of concentration) to a government agency.

Organized labor—ever sensitive to shifts in the legislative and administrative moods of the Capitol—has been quick to board the consumer bandwagon with support of Kefauver-type adventures.

And business? Its reaction thus far has been largely defensive.

Labor-Management Clamor

The steel dispute has made passage of some kind of stiff amendment to the Taft-Hartley Act nearly inevitable this year. Labor may not like it, and management almost certainly will not. If the case

(*Please turn to Page* 112)

O-KNI-CO MACHINE TOOL news

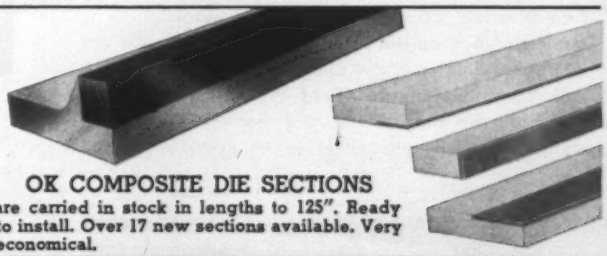
PRODUCTION FACTS THAT INCREASE YOUR PROFITS

PUBLISHED BY THE OHIO KNIFE CO., CINCINNATI, OHIO

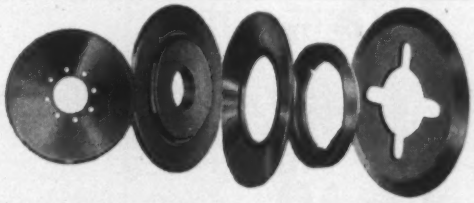
MANY COMPANIES NOW CUTTING PRODUCTION COSTS — INCREASING MACHINE LIFE AND ACCURACY WITH THESE OHIO KNIFE CO. HARDENED PRODUCTS

The products shown here are just a few of hundreds made by The Ohio Knife Co. of Cincinnati, Ohio. They are widely used as components by machine builders and as replacements when ordinary parts wear or break. The Knife Co. is internationally famous for their special hardening techniques, resulting in a reputation for producing products with long wear qualities. Many products are made by bonding high speed steel, tool steel or alloy steel to a mild backing. This gives the finest wear resistant surface possible. Perfect bonding is assured through use of a 2,500 ton forging press and rolling mill. Other products are especially hardened to meet the requirements of the job. All products are meticulously ground to extremely close tolerances. Specific bulletins are available FREE on all products.

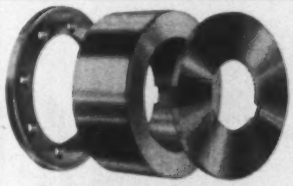
OK STANDARD CUT-OFF BLADES
carried in stock for many holders and machines. Also blades made to your prints or specifications.



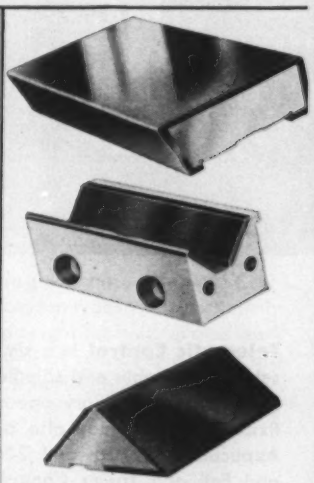
OK COMPOSITE DIE SECTIONS
are carried in stock in lengths to 125". Ready to install. Over 17 new sections available. Very economical.



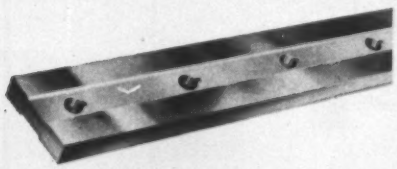
OK CIRCULAR SLITTING CUTTERS
for paper tubes, tissue, cellophane, leather, cloth, tape, cork, etc. Carried in stock.



OK ROTARY METAL SLITTING KNIVES AND SPACERS
in a complete range of sizes.

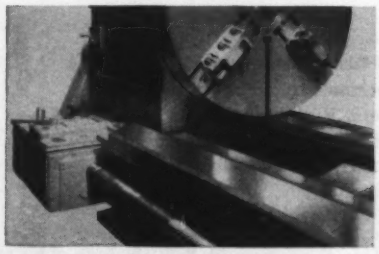


OK WAYS—GIBS
are practically wear-proof. Also available in aluminum bronze. Complete selection

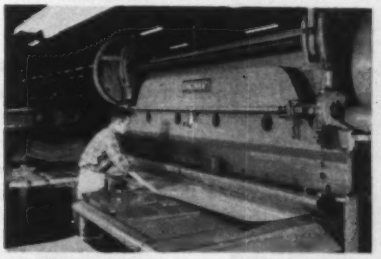


OK SOLID STEEL SHEAR BLADES
for all types shears and any type of shearing requirement.

OK CENTERLESS GRINDER BLADES
Complete range of sizes and designs carried in stock for quick delivery.



O-KNI-CO processed hardened ways on 60 inch lathe made by The Niles Tool Works.

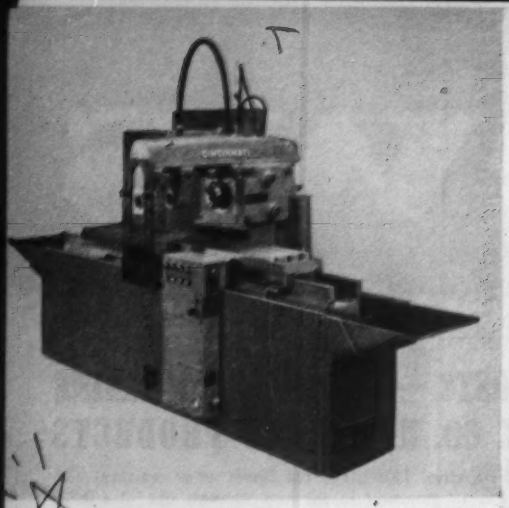


65 ton Cincinnati Press Brake equipped with long-wearing O-KNI-CO processed shear blades.

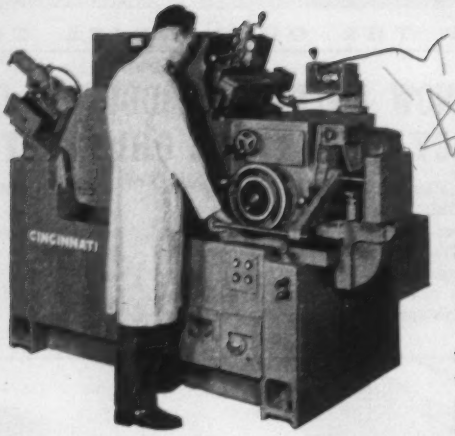
O-KNI-CO hardened bedways, cross ways on a G. A. Gray Co. horizontal boring machine.

FREE BULLETINS AVAILABLE • THE OHIO KNIFE CO., DEPT. 110-AF • CINCINNATI 23, OHIO

These STARS of

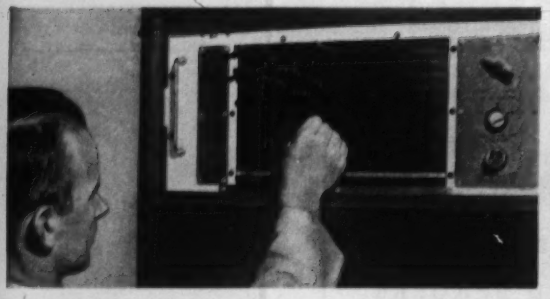


100 and 200 Series HyPowermatic Milling Machines have the flexibility for both small lots and high production runs. Two-direction table feed cycles and automatic spindle stop are standard feature-advantages. Built in plain and duplex styles with conventional table feed cycles, and automatic rise and fall and tracer controlled styles with Telematic selection of cycles.

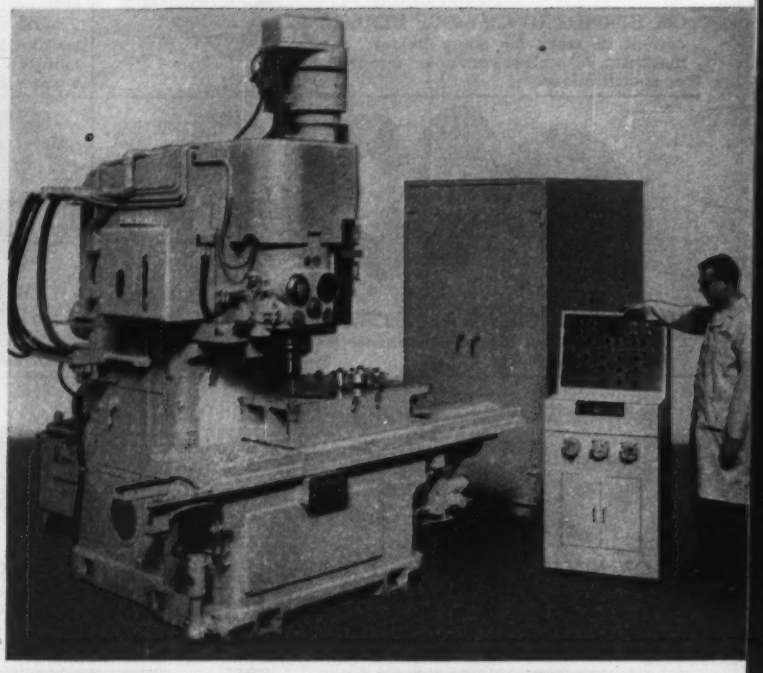


put new

Centuramic Centerless Grinders raise quality standards and broaden the range of the centerless method. The 210-6 is the "Handy Andy" size for job shops, while the 340-20 size at the other extreme introduces a new extra low-cost concept . . . thrufeed grinding with 20" wide wheels.



Telematic Control is a simple pegboard selection of table and spindle carrier automatic cycles. Auxiliary operations such as fixture clamping may also be plugged in. Applicable to 100 and 200 Series Rise and Fall and Tracer Controlled HyPowermatic Milling Machines.



Cincinnati Acramatic Numerical Control offers the unique advantage of unified machine and control design and responsibility. Its field covers simple two-axis positioning for drilling, to complex three dimensional contour milling. The above 16" Vertical Hydro-Tel Milling Machine shows a three dimensional setup.

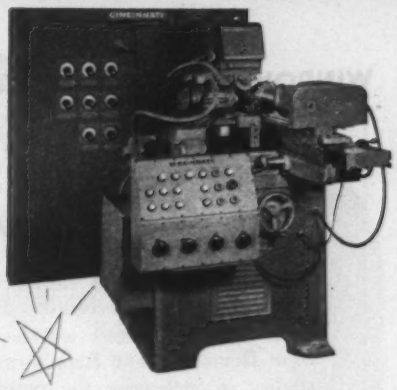
CINCINNATI

BUILDERS OF FINE MACHINE TOOLS: MILLING • GRINDING • BROACHING • ELECTRICAL DISCHARGE MACHINING • DIE SINKING • CUTTER AND TOOL GRINDING • PRODUCTION LINES • METAL FORMING • • HARDENING MACHINES

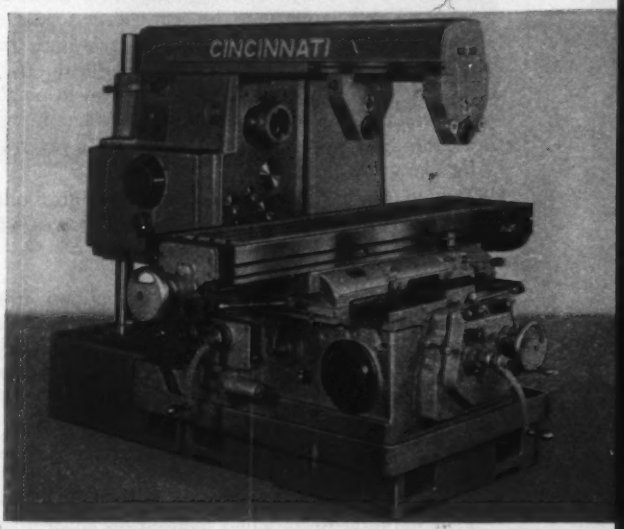
Adventures in PROGRESS

life in cost-cutting programs

ADVENTURES IN PROGRESS marked Cincinnati Milling's 75th year of serving the metalworking industry. The event starred many all-new machine tools. These machines represent something more than new equipment, they represent the Mill's philosophy of always striving to build better machines to help you create greater values in your products. Information on the stars of ADVENTURES IN PROGRESS may be obtained by writing to **The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

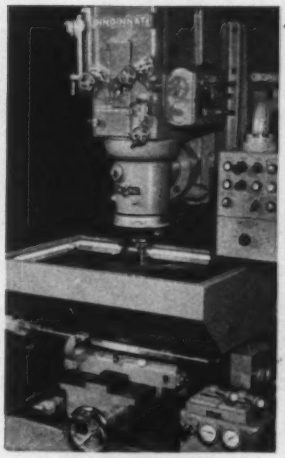


Automatic Cutter Grinder initiates a brand-new approach to cost prevention . . . the automatic precision sharpening of cutting tools. Cutter manufacturers and high volume users of plain and stagger tooth cutters will welcome this machine.



All-Purpose Milling Machine combines flexibility of knee-and-column types with productivity of bed types. Fixed height table facilitates work handling. Wide range of speeds and feeds are selected by power with a single lever.

Super Precision 4" Plain Grinder puts accuracy requirements of 25 millionths on a production basis. Cincinnati's Grind-a-Mate gaging system automatically sizes the part to a ring gage or mating member.



Elektrojet Electrical Discharge Machines embody the machine tool builder's approach to this highly significant method of removing metal. Give you 35 choices of equipment, covering the requirements for unusual or "impossible" machining operations on a wide variety of parts ranging from small missile components to forging dies.

CINCINNATI®

(*Concluded from Page* 108)

MAJOR LEGISLATIVE ACTIVITY

Taxes—A Presidential election year is the best time to hope for tax reforms.

Personal income taxes will be under heavy fire from Democrats and Republicans alike. The possibility of increasing the personal exemption is not ruled out. An over-all cut, especially in the upper brackets, is less likely.

Corporate taxes are also being reviewed. The administration's desire to come up with a budget surplus will work against cuts.

Depreciation reform is recognized as a necessity by many legislators, but the political overtones of any action may forestall it this year—unless the need for reform can be brought home to the public. A wide awake Treasury Department might do something through administrative action, but at this point Treasury seems prepared to wait for Congress.

Depletion allowances will get much Congressional talk—pro and con. The balance of power will work against any changes.

Foreign Relations—Increasing competition from foreign industries will strike repeatedly at that most sensitive part of a congressman's makeup: His constituency. The rising protectionist sentiment on Capitol Hill may well bring some significant developments in our attitudes.

The Buy American issue is bound to be discussed. Several bills have been presented to protect U. S. firms from "unreasonable" competition of foreign manufacturers when bidding on government contracts. Don't rule out the chance of reform, but don't take it for granted.

Quotas and tariff restrictions will not be discussed generally, but the administration will once again be asked to come up with a minerals policy.

Russian trade will be an issue if the cold war continues to thaw. Minor concessions are possible if we can settle our lend-lease bill with the USSR.

Foreign investment aids via tax concessions are likely.

Labor—Revision of Taft-Hartley injunctive procedures to prevent national emergencies caused by strikes in basic industries seems to be a must. A simple extension of the injunction in the steel strike could get Congress off a sharp political hook.

Compulsory arbitration will be resisted by the majority in labor and management.

Fact finding boards with the power to recommend settlements seem to be a relatively easy compromise.

Union monopolies and industry wide bargaining will be criticized soundly in Congress, but legislation is not likely.

Small Business — Presidential election years are usually a good time for small business legislation. On deck are measures to make small firms more competitive with big ones in defense business by guaranteeing them a larger share of the contracts. Compulsory legislation will be difficult to pass (and harder to administer), but the heat will be on the Pentagon to spread the work.

Re-equipment allowances in one form or another are being requested by powerful forces on the Hill.

Loan programs will probably be increased.

Prices and Wages—A January report from the Joint Economic Committee will touch off the inflation issue again. The administration will argue that a balanced budget is the best way to fight inflation.

Standby controls on prices and wages have been predicted if the inflationary spiral continues, but it is doubtful Congress will go that far.

Price increase notification to the federal government in certain industries will be talked about by many liberals.

Minimum wage increase (to $1.25) is likely.

Science—More federal interest in science is certain. Watch for a real effort to establish a new cabinet post, Secretary of Science. The job: Coordinate the many federal agencies with scientific interests.

(*Continued from Page* 108)

isn't resolved when the T-H injunction runs out, look for some short term remedy designed just for the steel case.

But even if it is settled without the need for Congressional action, something will be enacted to deal with any similar situations in the future. A fact finding board with the power to make recommendations is the most likely prospect for this year, but compulsory arbitration in basic industries is certain to receive more support as the decade grows older.

The merits of the steel industry's case have been half forgotten by the public—and the legislators—in the long months of negotiations. The Congressional temper toward

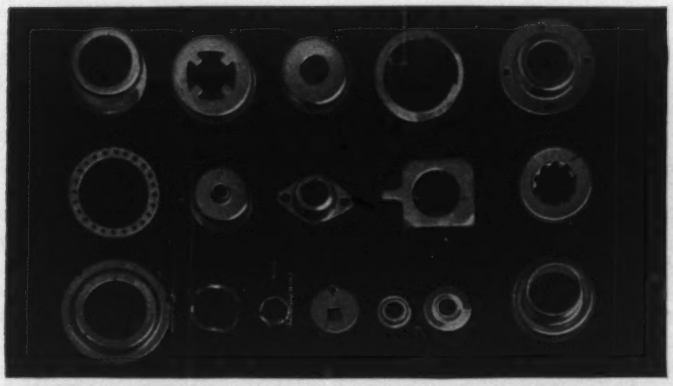
100,000 Washer Dies at Your Disposal

In the purchase of special washers to meet your specific requirements, an important item of initial expense is *die cost.* In addition, the time factor that enters into the designing and building of special dies to conform to your blue prints can prove costly in terms of curtailed production of the equipment on which the washers are to be used.

Here at our Milwaukee Wrot Washer Plant we have available what we honestly believe to be the world's largest inventory of Washer Dies . . . *more than 100,000 different* dies covering almost every conceivable type of washer. These dies, accumulated over a period of 73 years, are at your disposal *without cost* . . . ready for immediate production of washers in all classifications covered by this methodically indexed die inventory.

Whether you are in need of Standard or Special Washers . . . any type, any size, any material . . . consider Wrought Washer Mfg. Co. your No. 1 Source. We can also take care of your requirements for all kinds of stampings.

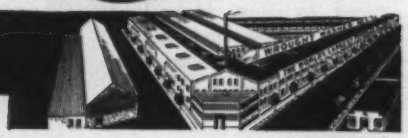
Let us quote on your washer and stamping needs. *Write for New Catalog No. 40-B.*



WROUGHT WASHER MFG. CO.

THE WORLD'S LARGEST PRODUCER OF WASHERS

2103 SOUTH BAY STREET • MILWAUKEE 7, WISCONSIN



A 8590-1-PA

National Aeronautics & Space Administration.

Racing for the Moon:

Industry Is on the Spot Too

The NASA scientist at the left hopefully regards a hypothetical space vehicle. The possibility of a Russian in orbit around the earth this year cannot be discounted. Our present program calls for a similar feat by 1961-62.

This month, Rep. Overton Brooks (D., La.), head of the House Science & Astronautics Committee, begins extensive hearings on our space program. "It shall be our aim," he warns, "to probe every facet of the program to determine: 1. Why this nation is behind in the exploration of space. 2. What steps can be taken to place the U. S. where it belongs, in the forefront."

Behind the hearings (at which both government and private witnesses will be heard) are months of intensive study by committee staff members. Industry will be asked if the demands of the national space effort will be put before company gain.

Similar questions will be put to competing government agencies and military services. In addition, their relations to private industry will be studied for possible selfish interests not calculated to help the national effort.

both sides now is "a plague on both your houses."

Foreign Relations Controversy

Businessmen can lose still another battle by default—the resolution of contradictions rising from foreign trade, aid, and competition.

Metalworking's foreign trade is declining partly because of foreign aid which has helped other nations build plants to produce goods we once exported to them. A partial solution may be less direct government aid abroad and more indirect assistance through U. S. business investments overseas. More support from businessmen is needed for proposals like H.R. 5, introduced by Rep. Hale Boggs (D., La.). It allows deferment of taxes on overseas enterprises. The Commerce Department wishes to restrict the deferment to underdeveloped countries.

Business can also be more zealous in seeking help from the administration in negotiating with other countries for the removal of their restrictions on our goods (machine tools, for example).

Industry is divided on the question of tariffs and quotas and so is Congress. The result is that no sensational departures are likely in 1960. A clue to things to come may turn up this month. The Tariff Commission reviews the lead-zinc situation.

Action is more likely on the Buy American issue. In the field of federal purchases, particularly for large electrical equipment, several bills are in the hopper to test U. S. firms' bids against foreign companies' proposals with a labor cost factor.

Summary

The core of the foreign trade-competition problem is the fact that our wages are three to eight times those in Europe and Japan. And how can the administration or Congress do anything about that?

One answer: By proposing and enacting fair labor-management relations laws that will help prevent our scales from rising so fast. And how can that come about if the Washington climate of opinion is antibusiness? The obvious reply: Change the climate.

We're right back to Commerce Secretary Mueller's advice on a businessman's program for action. Some of that action will come naturally in 1960 because this is a Presidential election year.

The problem will be to keep up the momentum after next November's elections. That will be doubly challenging because the voting results, particularly for Congress, are likely to be discouraging to most of the business community.

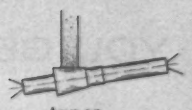
Versatility and quicker setups cut grinding costs for toolrooms and short run production

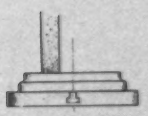
Landis 10" x 20" and 10" x 24" Universal Cylindrical Grinders feature Microsphere Wheel Spindle Bearings for maximum accuracy, high finishes and dependable operation.

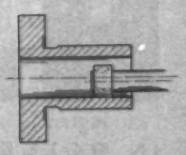
LANDIS
precision grinders
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

Grinding jobs which can be done on this machine

traverse and infeed


taper


face and angle


internal—straight and angle

YOU GET BIGGER SHAFTS IN THE SAME SPACE WHEN YOUR "SPECS" READ HYATT

To gain more space, simply eliminate the separable race from a Hyatt Hy-Roll bearing. For Hyatt rollers will operate directly on any shaft or bore that you've hardened and ground to bearing specifications. But, first be sure you're using Hy-Roll bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

Replacement bearings available through United Motors System and its authorized bearing distributors.

HYATT HY-ROLL BEARINGS

IN ROLLER BEARINGS HYATT IS THE WORD FOR GM RELIABILITY

Detroit Drives for Economy Decade

SIMPLIFICATION is motordom's watchword as Detroit opens the next decade with a rush toward compact car designs and less costly manufacturing techniques. The industry looks for 7.2 million sales next year including imports.

Detroit is looking for manufacturing techniques that will reduce costs, so car prices won't outstrip inflationary rises. The approach means less machining of parts: The industry wants components cast, extruded, and formed to near finish tolerances in initial stages.

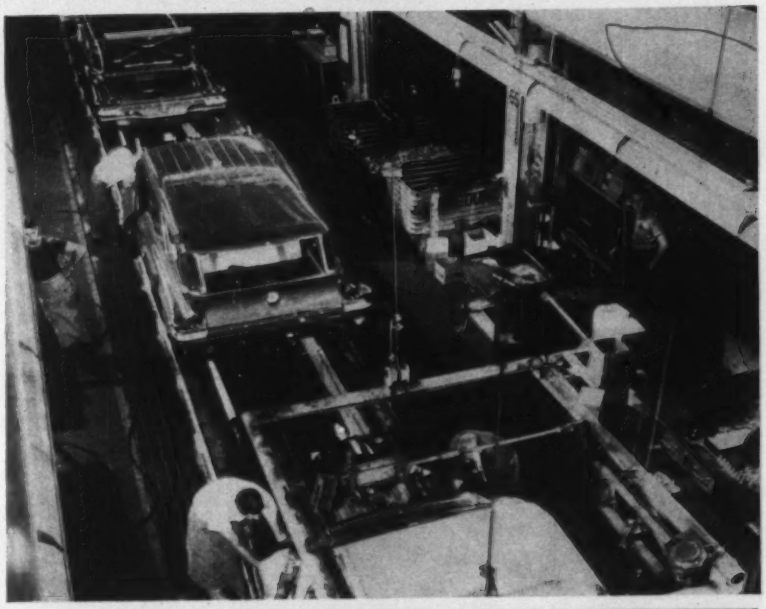
Where Makers Look

Detroit will move deeper into diecasting and permanent mold casting next year. Aluminum is gaining ground, and the industry finds diecasting is becoming the more efficient and less costly means of forming aluminum parts such as engine blocks, heads, and housings. But more experience is needed before diecasting can be fully used for the volume carbuilders demand. Captive plants will use permanent mold techniques and automatic pouring lines for cast parts. Machine tool builders will specify more carbide cutting tools, higher speeds and feeds to cut and finish the nonferrous metal. More than 80 per cent of the aluminum used in cars of the '60s will be cast.

Look for high silicon aluminum to be extruded for close tolerance parts like cylinder liners. Extruded gears are expected to turn up in cars by the mid-1960s. Aluminum companies say extruded bumpers will be seen on some models by 1962. Stamped aluminum bumpers are expected in '61.

Assembly Sparks Redesign

Simplified assembly procedures go hand in hand with simplified manufacturing methods. The most popular technique now is to eliminate as many parts as possible through redesign. The approach makes for less costly assembly and opens the door for automatic assembly operations.



U. S. AUTO PRODUCTION

(In thousands of units)

	1960*	1959†*	1958	1957
GM	3,164	2,509	2,169	2,816
FMC	2,153	1,745	1,220	1,890
CHRYSLER	929	735	581	1,222
AMC	481	394	217	114
S-P	173	147	57	73
TOTALS	6,900	5,530	4,244	6,115

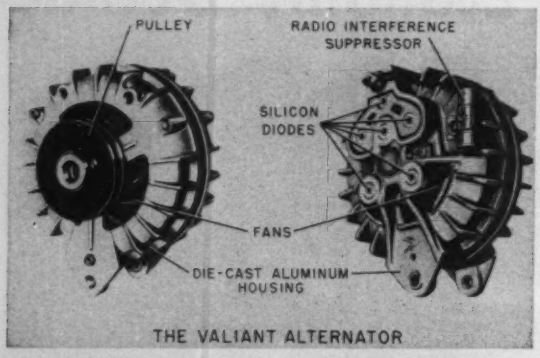
*Projected—STEEL estimate. †Preliminary. Source: *Ward's Automotive Reports.*

Ford's Falcon is an example. Its door frame has only two parts instead of the usual 21. The door line could be adapted to automatic assembly now, say company engineers. The Falcon engine has 120 fewer parts than the standard Ford six cylinder. Its manifold and head are integrally cast to reduce weight and simplify manufacturing and assembly. Result: Cost savings of better than 18 per cent on the two parts alone.

Another part of the redesign picture: Plan parts that can be built from several materials on the same lines. GM's Diesel Engine Div. can already turn out aluminum or gray iron engine blocks on the same line with few changes in speeds, feeds, and cutting tools.

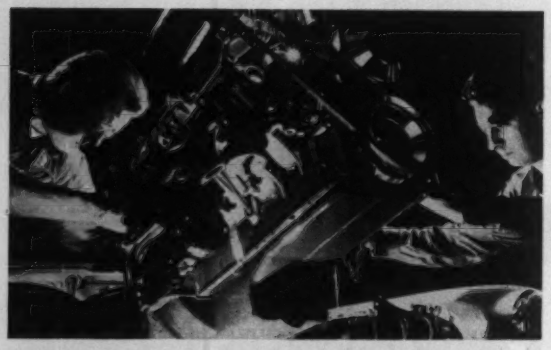
As the auto companies adopt

Industry Looks at These 1961 Design Highlights

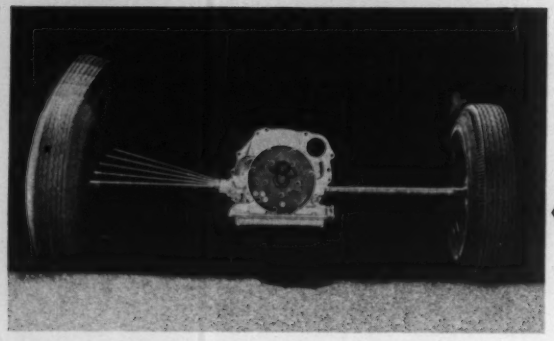


THE VALIANT ALTERNATOR

Alternator



Aluminum Engine



Trans-axle

unitized construction, more welding equipment will be needed. One Chrysler Corp. engineer claims the company's 1960 unitized bodies need 30 per cent more welds than the body and frame they replaced. Look for more spotwelding and fewer resistance and arcwelds in body construction.

Old Favorites Revived

Nonferrous trim materials like zinc will make a comeback in the next few years. Improved plating standards and processes developed through the American Zinc Institute and its studies at Battelle Memorial Institute, Columbus, Ohio, mean the easily diecast material will regain favor among stylists. Engineers can use it without fearing that warranty costs (for failure in plating life) will boost end product costs.

Virgil M. Exner, Chrysler Corp.'s styling vice president, has told STEEL that with the improvements that have been made in plating, he expects the older trim material to replace aluminum for some decorative applications. That doesn't mean aluminum will lose favor with car designers. It took the aluminum companies four or five years to sell industry engineers on the fact the metal could be used in cars even though its initial cost was higher than that of competitive metals. Now that the industry has become convinced, engineers make the natural mistake of thinking aluminum could do everything. It can't. Result: Carbuilders are starting a drive to determine where aluminum can best be used and where zinc or stainless steel will prove to be the least expensive, most durable material.

• **Plastics Push**—Some 314 automotive parts can be made from plastic materials, claims E. I. du Pont de Nemours & Co. Inc., Wilmington, Del. It believes it can double that number by 1965 and save the auto industry $45 million. Plastics account for 18 lb of each car built today.

Other material trends find increasing tonnage shipments of galvanized steel to body plants as carbuilders seek better methods of rustproofing unitized bodies.

Improved carbon steels mean that designers will be able to switch from more expensive alloy stock for many smaller parts like exhaust valves and possibly for torsion bars.

Designs Pace Technology

To make use of simplified manufacturing and assembly methods,

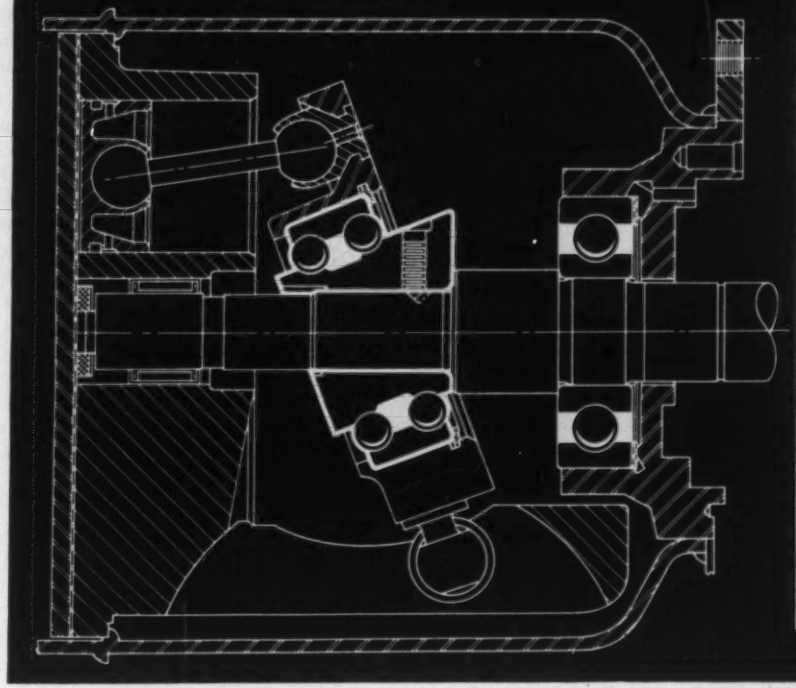
Automotive Plant and Equipment Spending

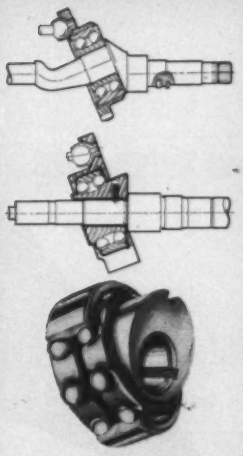
(Millions of dollars)

1960*	$980
1959†	587
1958	568
1957	1,058
1956	1,689
1955	1,128

*Estimated. †Preliminary.
U. S. Department of Commerce.
Automobile Manufacturers Assn.

CASE HISTORIES





Redesign of high capacity compressor shaft and bearing assembly eliminated costly angled shaft in favor of unique, efficient ball bearings.

Illustration: Courtesy, Frigidaire Division, General Motors Corporation

Unique N/D Wobble Plate Ball Bearing Simplifies Axial Compressor Design!

CUSTOMER PROBLEM:

In developing the ideal compressor for automobile air conditioning unit, customer engineers faced the problem of further design simplification and refinement of pilot model.

SOLUTION:

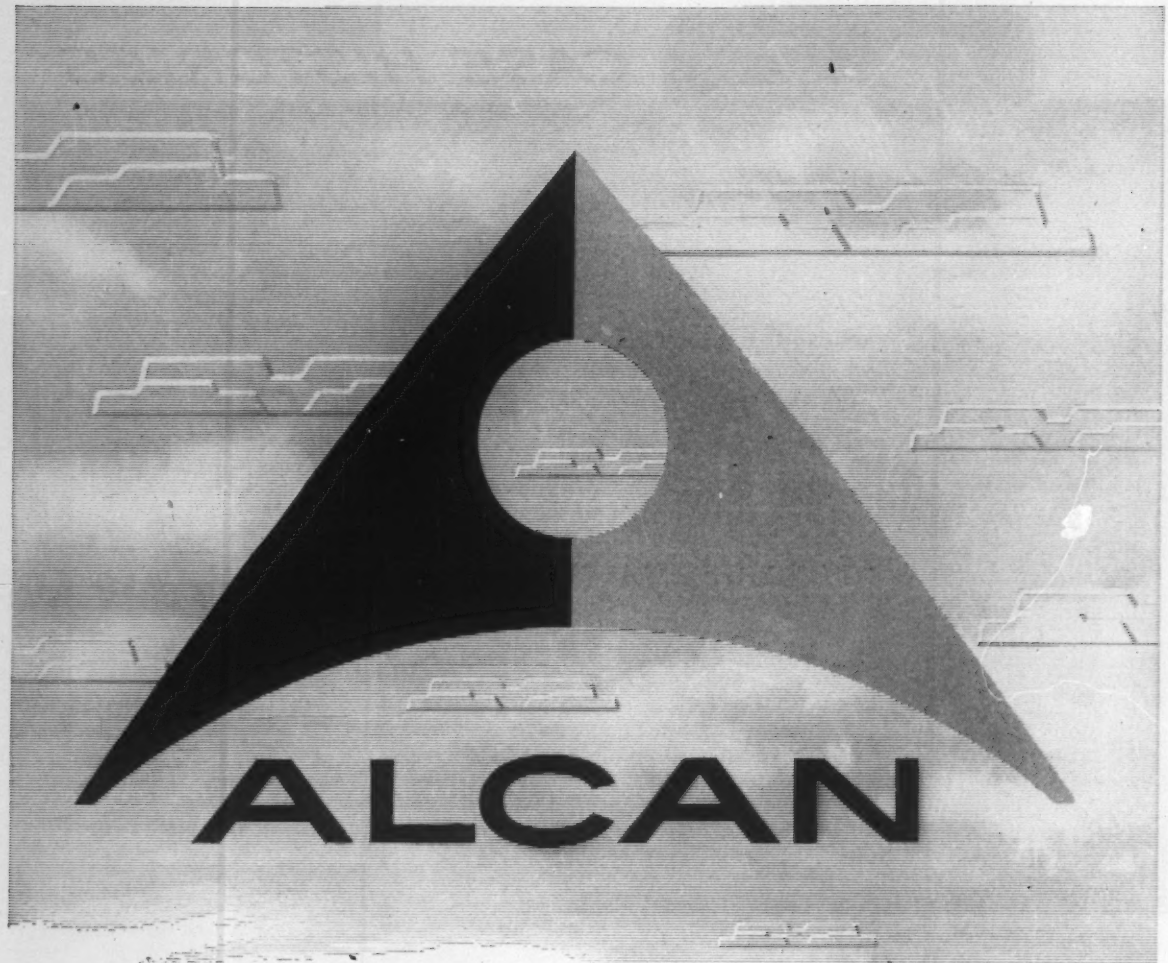
N/D Sales Engineer, in co-operation with customer, pointed out a possible design simplification in the crankshaft bearing assembly. By providing a specially designed N/D precision ball bearing with shaft bore at an angle, a straight shaft could replace the original pilot model crankshaft. The wobble plate angle would then be supplied by the bearing rather than the shaft. First tests proved the new and simpler shaft/bearing assembly met customer's rigid performance standards in high capacity compressor. Final testing of some 300 pilot models, both in the laboratory and on road test cars, finalized the design. Now . . . all GM air conditioner equipped cars are cooled with the aid of N/D ball bearings.

If *you're* working on new designs . . . or redesigning, why not call your N/D Sales Engineer. He knows the performance possibilities of virtually every ball bearing made . . . and, *he knows what can be done with special bearing designs!* For more information write New Departure Division, General Motors Corporation, Bristol, Connecticut.

NEW DEPARTURE

BALL BEARINGS

proved reliability you can build around



Now - a new symbol
for top quality aluminum!

This striking design is Aluminium Limited's new corporate symbol, and your assurance of the finest in aluminum ingot products, service and research.

Like the company it identifies, the new mark stands for primary aluminum with quality assured by Aluminium's world-wide resources: unequalled bauxite and alumina facilities; massive hydro-electric plants and smelters; the latest in research facilities in Canada, England and Switzerland.

For information on how these world-wide facilities can serve you—call our nearest office.

Aluminium Limited

ALCAN

Ingot Specialist...serving American Aluminum Fabricators—

In the U.S.—Aluminium Limited Sales, Inc., 630 Fifth Avenue, New York 20, N.Y. CLEVELAND • CHICAGO • LOS ANGELES • DETROIT • ATLANTA • ST. LOUIS

Additional distribution (Alcan Foundry Alloys): **Apex Smelting Co.**, Chicago, Cleveland, Los Angeles. **Charles Batchelder Co., Inc.**, Botsford, Conn. **Aluminum Inc.**, Fort Lauderdale, Fla.

automakers are designing next decade's cars to weigh less and cost less to operate, maintain, and construct. Result: Aluminum engines and Transaxles will be the big production breakthroughs in the early 1960s. Improved brakes and simplified suspension systems are anticipated before 1970.

Corvair's powerplant is virtually all aluminum now, although some competitive suppliers (and certain GM groups) don't like the term. AMC and the Buick-Oldsmobile small car are supposed to get aluminum engines in 1961. Chrysler will bring out a special aluminum head for its slant six engine later this year. Ford and standard Chevrolets should be ready for '62. Truckers expect to see an aluminum V-6 by '62 or '63.

Initially, it appears that most of the engines will have some kind of cylinder liner. Conventional gray iron will get first nod. Beyond that, the industry is looking at stainless steel liners and may wind up with extruded, high silicon aluminum liners before eliminating them entirely. Before the liners are dropped, piston rings will have to be improved to last in aluminum bores.

Major components to be integrated will be the differential and transmission—the so called Transaxle. Some tooling for such a unit has already been released by General Motors. It's expected to appear in 1961 Cadillacs and Oldsmobiles. Ford and Chrysler are also readying similar versions. They may try to combine the Trans-axle with a central hydraulic system, which will delay introduction for three or four years. Ford may combine it with front wheel drive.

● **Turbines Trudge On**—The turbine engine is slow coming because the industry still has a full tooling amortization cycle to complete on aluminum engine facilities. Another factor: It's still not certain that turbines will be as useful as piston engines in passenger cars. They should appear in trucks by the end of the 1960s. GM looks like the best bet on this.

Perhaps the biggest change in automobile design in the next decade will be the industry-wide move to unitized body construction. There's little doubt that they are coming for all but the long wheelbase cars like Cadillac and Imperial. The unitized bodies will be phased in gradually. They'll probably be the semiunitized design now being utilized by Chrysler Corp. The next standard size car to adopt it will probably be Ford.

● **The Boom Breaks Loose**—An indication of growth is revealed in next year's spending plans for the transportation industry (S.I.C. group 37). The companies, which include the automakers and their suppliers, will increase their capacity 4.1 per cent in 1960. About 44 per cent of the firms will expand. Of those, 18 per cent will build plants; 40 per cent will build additions to plants; and 67 per cent will install new equipment.

ECONOMY CARS TAKE BIGGER BITES

HILLMAN Imports			VALIANT Compacts	
	Sales	% of market	Sales	% of market
1960*	600,000	8.3	1,675,000	25
1959†	619,500	10.5	778,800	13.2
1958	367,373	7.9	232,515	4.5
1957	197,417	3.3	138,494	2.3

*Estimated. †Anticipated. Adopted from *Ward's Automotive Reports.*

Marketers to Regroup

Compact cars have been accepted and will create major shifts in marketing strategy. Emphasis will be on function rather than prestige value. L. L. Colbert, Chrysler Corp.'s president, puts it this way: "Not long ago, passenger cars were all-purpose vehicles, and one car served a family for all its activities. But life in the '60s will be more complicated, more diversified. People have become more individualized in their personal tastes and needs. They'll want different kinds of cars for different purposes."

Further examples of such thinking come from Chrysler which is developing a whole family of compact cars of which the Valiant is merely the first. Ford Motor Co. has at least 19 other models under experimental design. Most of them fit into the compact category. As an example of Ford's thinking, look for the 1961 Continental series to appear as a compact, sporty, luxury car similar to the Thunderbird in concept. It may share the T-Bird body. Large Lincolns reportedly will be dropped from the lineup.

● **Imports Accepted**—Another mar-

(*Please turn to Page* 124)

....only with hydraulic design

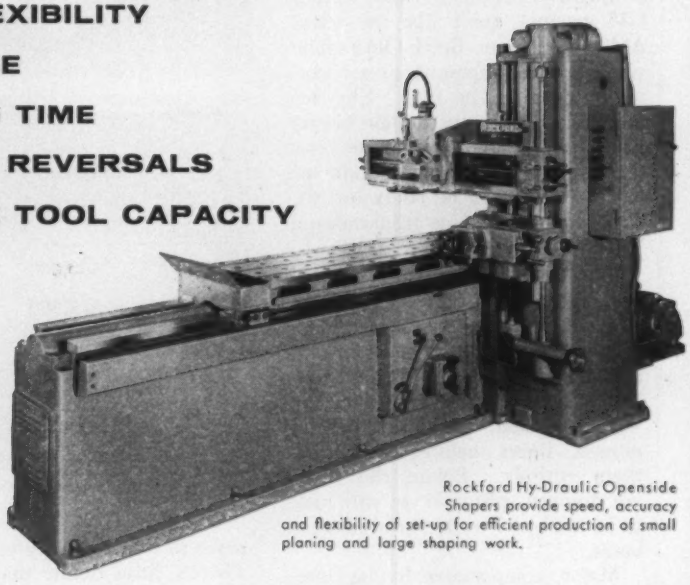
GREAT SET-UP FLEXIBILITY

WIDE WORK RANGE

SHORT MACHINING TIME

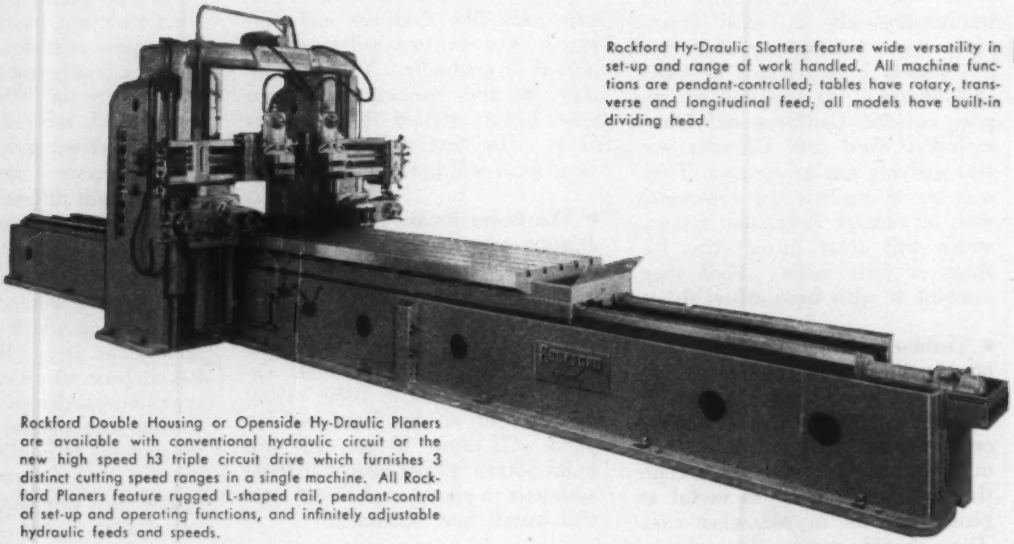
HIGH-SPEED, FAST REVERSALS

NATURAL CARBIDE TOOL CAPACITY



Rockford Hy-Draulic Openside Shapers provide speed, accuracy and flexibility of set-up for efficient production of small planing and large shaping work.

Rockford Hy-Draulic Slotters feature wide versatility in set-up and range of work handled. All machine functions are pendant-controlled; tables have rotary, transverse and longitudinal feed; all models have built-in dividing head.



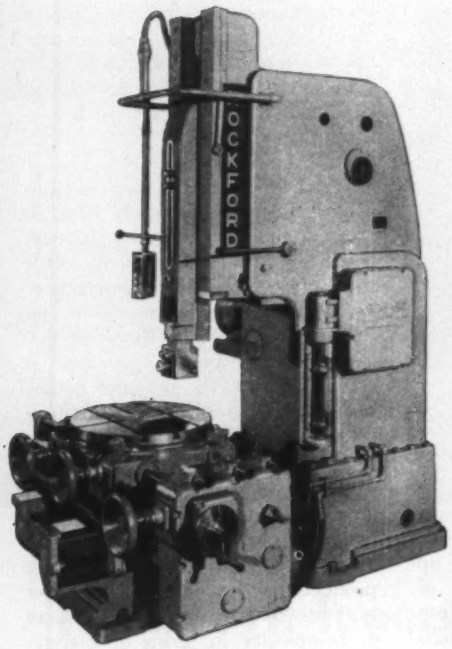
Rockford Double Housing or Openside Hy-Draulic Planers are available with conventional hydraulic circuit or the new high speed h3 triple circuit drive which furnishes 3 distinct cutting speed ranges in a single machine. All Rockford Planers feature rugged L-shaped rail, pendant-control of set-up and operating functions, and infinitely adjustable hydraulic feeds and speeds.

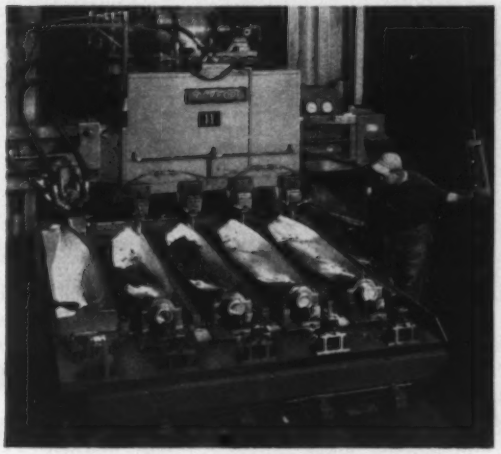
Hydraulic drive and feeds, as basic features of Rockford Hydraulic Machine Tools, provide outstanding performance measured in terms of work quality, high production and low operating cost. They also provide the cushioning action essential to the use of modern carbide tools.

do you get these advantages!

Today, countless metal-cutting operations are performed effortlessly, at low cost, and with high production rates on Rockford Hy-Draulic designed machines. Hydraulic control and power respond instantly so that inexperienced operators easily adapt infinite speeds and feeds to the most complex and accurate machining cuts.

Compare your present shaping, planing or slotting operations with these modern production features, and determine the savings available with Hy-Draulic flexibility. Our engineers will gladly furnish estimates for your particular requirements.





Rockford Hy-Draulic KOPY-KAT duplicator transfers single or 2-dimensional forms directly to the work on Rockford Hy-Draulic Shapers, Planers and Slotters. The hydraulic duplicator valve is so sensitive, so exact, that positive duplication of complex forms is completed with the ease of straight production machining.

RMT

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET ROCKFORD, ILLINOIS

U. S. TRUCK PRODUCTION

(In thousands of units)

	1960*	1959†	1958	1957
BIG THREE	847	498	642	835
INDEPENDENTS	363	631	229	255
TOTAL	1,210	1,129	871	1,090

*STEEL's estimate. †Preliminary. Source: *Ward's Automotive Reports.*

(*Concluded from Page 121*)

keting area to watch: The import field. Detroit has accepted imports because they're filling a gap in the under $2000 class which the present, U. S. built economy cars don't reach. To hang on to their share, importers are offering more Americanized styling and popular accessories like semiautomatic transmissions. Right now, Detroit thinks import sales will level off at about 10 per cent of the market. If they continue to rise, American producers are readying smaller cars to compete with the foreign jobs.

The industry plans to market its own compacts overseas. Each of the Big Three is programing more exports for 1960 (See STEEL, Dec. 7, 1959, p. 108). Chrysler Corp. will start assembling Valiants in its Rotterdam plant this spring.

Company Rundown

Each automaker has a goal in 1960. General Motors plans a concerted effort to regain its traditional share of the market. Motordom's "Mister Big" wound up 1959 with about 45 per cent of sales because a lack of steel cut into its last quarter output. It traditionally accounts for nearly half of the domestic market. Periodically, Detroit rumbles with rumors that the corporation plans a smaller share of the market to avoid further inquisitions at the hands of Uncle Sam's trustbusters. That isn't true. GM will take all the market it can get.

● **Ford's a Winner** — Ford Motor Co. is making what may turn out to be one of the industry's most significant revivals next to the rebirth of American Motors Corp. The Dearborn, Mich., carbuilder is taking slightly more than 30 per cent of the market now and will be shooting for 32 to 33 per cent in 1960.

The company is continuing to reorganize its manufacturing and purchasing activities. Ultimate objective: Place all manufacturing responsibilities in Ford Div. hands. Sales staffs will remain split for another year or more.

● **Chrysler Touts Design**—Chrysler continues with its prime ambition of rebuilding its former reputation for engineering excellence. Look for a rash of intriguing and practical design features on Chrysler Corp. cars in the next decade. The company has already adopted torsion bars, unit bodies, an alternator, Electroluminescent lighting, and a Slant Six engine. Now it's working on new braking and hydraulic systems. Look for Chrysler to lead the field with engineering breakthroughs.

● **AMC Needs Space** — American Motors Corp. is definitely back in the automobile business. It took 8 per cent of 1959 sales, almost a third more than 1958's penetration. Its immediate objective is to get more space to build Ramblers because George Romney, president, is convinced that 50 per cent of the market will be devoted to compact cars before 1965.

Says Mr. Romney: "The consumer is insisting not only on greater functionalism but greater dependability and value. The showoff and gadgetry aspect of many products has lost much of its luster in customer persuasion. The cost of complexity in terms of maintenance, insurance, repair, service has become significant in itself."

Quoting Victor Hugo, Mr. Romney challenges the 1960s: "No army can withstand the strength of an idea whose time has come!"

● **S-P Spreads Out**—In South Bend, Ind., Studebaker-Packard Corp. is grateful to the economy car trend that saved it from bankruptcy. The company still feels it needs more product diversification to back up the Lark. It has already acquired Gering Products Inc., Kenilworth, N. J. (plastic products), and C.T.L. Inc., Cincinnati, (space research). Now it's negotiating with Oliver Corp., Chicago, a diversified farm equipment maker.

12 Ton Plymouth Locomotive operates 24 hours daily over 10 mile track system at this modern steel mill

PLYMOUTH lowers production costs by keeping steel in process on the move!

You get the reliability that returns greater profits when you put a Plymouth Locomotive to work—and the more continuous usage you give it, the more you benefit. There are many good reasons for that.

Plymouth Locomotives are built to handle big jobs with speed and efficiency around the clock—in all kinds of weather. Instant availability, low maintenance requirements, and faster switching, spotting and hauling performance reduces costs all around. Smooth starts and ease of control make Plymouth popular with the operators, reduce fatigue, and keep efficiency high.

We make both gasoline and Diesel Locomotives from 3 to 80 tons—either mechanical or Torqomotive (hydraulic torque-converter) drive—there's a Plymouth Locomotive that will fit your requirements perfectly.

"Saving time and money with our Torqomotive," says this user.

Within a few months after the Plymouth Diesel Torqomotive shown above was delivered, this Eastern steel manufacturer knew they had an outstanding locomotive. "Too early for actual cost figures," was the report, "but haulage by Plymouth is superior to previous methods. Our operator likes it better, too."

Send us a brief outline of your operation and we'll send you a recommendation promptly. Address: Plymouth Locomotive Works, The Fate-Root-Heath Company, Dept. A-1, Plymouth, Ohio.

PLYMOUTH® LOCOMOTIVES

WITH TORQOMOTIVE DRIVE

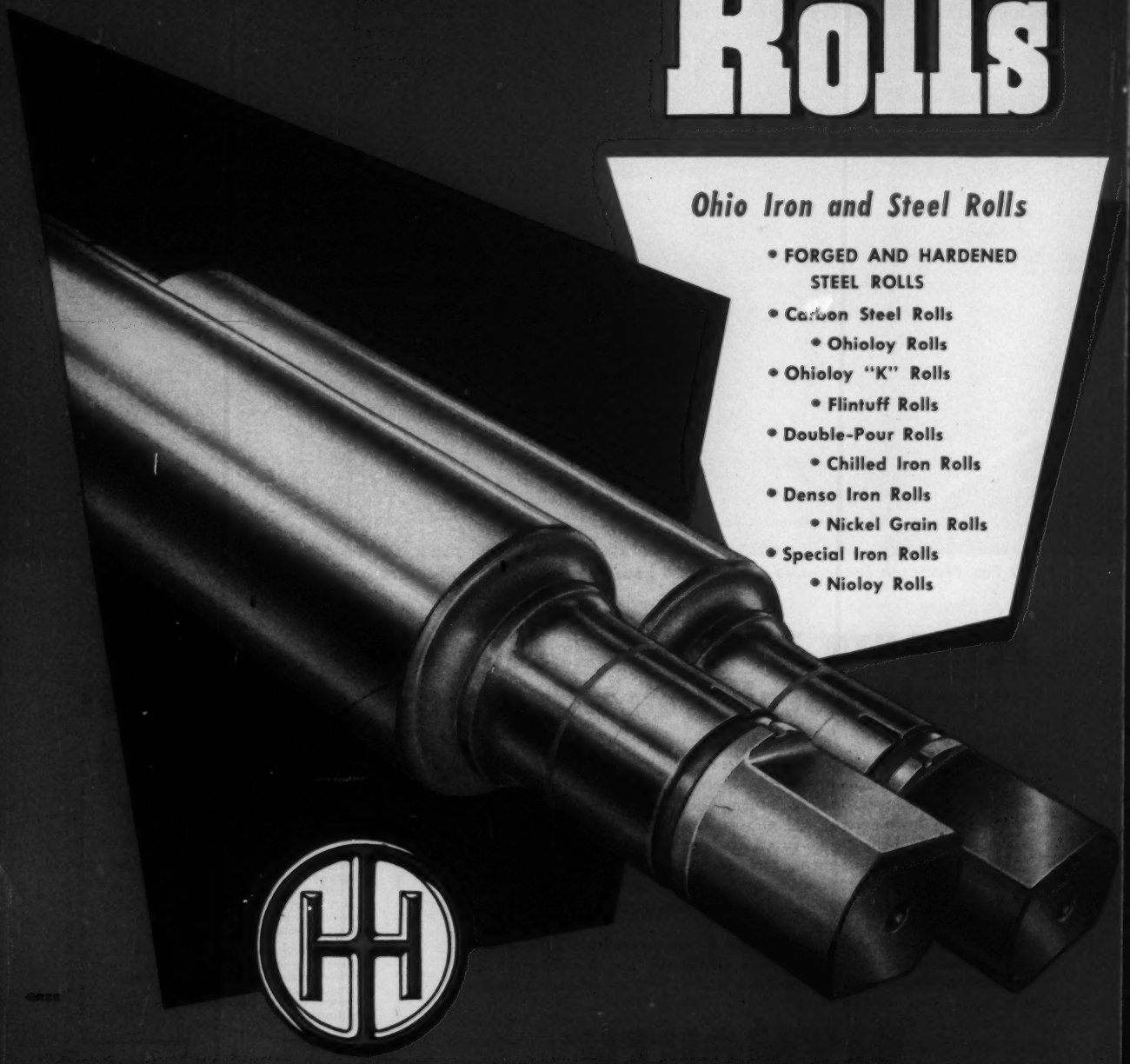
KEEP POWER

PLYMOUTH LOCOMOTIVES— in PROGRESSIVE INDUSTRY throughout the WORLD

ALSO BUILDERS OF F-R-H CERAMIC MACHINERY

Ohio Rolls

SHAPING METAL FOR ALL INDUSTRY



Ohio Iron and Steel Rolls

- FORGED AND HARDENED STEEL ROLLS
- Carbon Steel Rolls
- Ohioloy Rolls
- Ohioloy "K" Rolls
- Flintuff Rolls
- Double-Pour Rolls
- Chilled Iron Rolls
- Denso Iron Rolls
- Nickel Grain Rolls
- Special Iron Rolls
- Nioloy Rolls

THE OHIO STEEL FOUNDRY CO., LIMA, OHIO

PLANTS AT LIMA AND SPRINGFIELD, OHIO... *Virtually at the center of the steel industry*

EUGENE G. SHEASBY
Bliss & Laughlin v. p.-sales

THOMAS C. JONES
Nalco Chemical president

JOHN F. PROBST
South Bend Lathe president

RUSSELL C. TAYLOR
ACF Industries president

Eugene G. Sheasby, general sales manager, **Bliss & Laughlin Inc.**, Harvey, Ill., was elected vice president-sales. He joined the company Jan. 1, 1958, and has been associated with the steel industry for 15 years.

Thomas C. Jones was elected president, **Nalco Chemical Co.**, Chicago. He succeeds **Joseph A. Holmes**, now vice chairman. Mr. Jones, a director of Nalco's board since 1953, and a member of its executive committee, has been with Aluminum Co. of America for over 40 years. He was Chicago district manager.

John M. Fox fills the new post of director of manufacturing, **Black & Decker Mfg. Co.**, Towson Md. **Thomas M. Griffith** was named to the new post of director of quality control. Mr. Fox was manager of the Hampstead, Md., plant. Mr. Griffith was quality control manager.

J. S. Urbanik was given new responsibilities for managing **Kaiser Aluminum & Chemical Corp.'s** wire and cable works at Bristol, R. I. He continues as Electrical Conductor Div. manager of plant operations. He moves from the Newark, Ohio, Works to Bristol. **F. S. Bartlett**, former Bristol works manager, was named to the new post of division product projects manager.

John R. Noreen was appointed purchasing agent, **Jones Machinery Div.**, Chicago, Hewitt-Robins Inc. He was purchasing agent of Cory Corp., and previous to that was senior buyer for Rheem Mfg. Co.

John F. Probst was elected president, **South Bend Lathe Inc.**, South Bend, Ind., subsidiary of American Steel Foundries. He succeeds **Russel E. Frushour**, retired, but remaining as a consultant. Mr. Probst was vice president. **Richard S. Anderson** was made secretary-treasurer replacing **Maurice Howard**, retired.

John F. Torley was appointed vice president-manufacturing, **National Malleable & Steel Co.**, Industrial Div., Cleveland. He was manager of the Chicago Works, and is replaced by **William Jost Jr.**, former general superintendent.

J. K. Deasy was appointed vice president-purchasing and traffic; **W. Harry Wright**, vice president-chief engineer of **Weirton Steel Co.**, Weirton, W. Va., division of National Steel Corp.

Federal Foundry **Supply Div.** of Archer-Daniels-Midland Co., Cleveland, named **Victor M. Rowell** manager of product development; **Daniel R. Chester** manager of products and services; **John M. Sweeney**, technical service manager.

William L. Parcell, former vice president and director of sales, was named executive vice president of **Ridge Tool Co.**, Elyria, Ohio. **R. D. Fye** was made sales manager; **H. L. Palmer** advertising manager and assistant sales manager. **Herman Weible** was appointed plant manager; **Clarence T. Heintz** production superintendent. **John Meese** will be in charge of product development; **Anton Janik** will be toolroom superintendent.

Russell C. Taylor was elected president of **ACF Industries Inc.**, New York, and **James F. Clark** was elected chairman of the executive committee. Mr. Clark was president. Mr. Taylor retired early from American Can Co. where he was an executive department vice president.

A. D. Lumsden was appointed manager of operations, Wire Products Dept., **Hewitt - Robins Inc.**, with headquarters at the wire products plant in King-of-Prussia, Pa. He was product sales manager of the department.

Dresser Industries Inc. promoted officers of its **Dresser-Ideco Co.** at Columbus, Ohio: **John L. Pausch** was raised to the new post of chairman; **Henry Knippenberg** was appointed president and general manager. Until August of this year, Mr. Knippenberg was manager of product line development for Dresser Mfg. Div., Bradford, Pa. He transferred to Dresser-Ideco Co. as assistant to Mr. Pausch, president and general manager.

Rockford Machine Tool Co., Rockford, Ill., elected **Harry B. Newton** chairman, **Kenneth M. Allen** president, **R. C. Christenson** vice president-secretary.

Fred F. Moore Jr. was appointed general sales manager, **Kensico Tube Co.**, Mt. Kisco, N. Y. He has been with the Wolverine Tube Div. of Calumet & Hecla Inc. since 1947.

Remick McDowell, executive vice president, was elected president, **Peoples Gas Light & Coke Co.**, Chi-

BEN F. BREGI

T. S. GATES

National Broach & Machine promotions

RALPH W. UPDEGRAFF

ROBERT L. SISSON

promotions at Timken Roller Bearing

cago. **Robert M. Drevs**, secretary, was elected a vice president.

Ben F. Bregi was elected vice president-manufacturing and research; **T. S. Gates** vice president-engineering, **National Broach & Machine Co.**, Detroit. Mr. Bregi succeeds **Max B. Mentley**, who remains as a consultant. Mr. Gates, former chief engineer, succeeds Mr. Bregi.

Armco Steel Corp.'s Middletown, Ohio, Works appointed **Russell Martin**, former superintendent of the assigned Maintenance Dept., to the Armco International Corp. for assigment in Spain. He is succeeded by **John J. Timberlake**, former superintendent-Maintenance Dept.

Bethlehem Steel Co. announces changes in its Sales Dept. effective Feb. 1. **W. J. Stephens**, currently an assistant general manager of sales, will be assistant vice president. **D. C. Roscoe**, also an assistant general sales manager, becomes general manager of sales to succeed **K. L. Griffith**, retiring. **S. S. Cort**, general sales manager-Pacific Coast Div., becomes an assistant general sales manager.

Aloysius M. Tullo, vice president and general manager of **Worthington Corp.'s** Harrison, N. J., Div., replaces **Elston J. Tribble**, resigned, as a group vice president of the corporation. **William A. Finn**, general manager, Holyoke, Mass., Div., was promoted to general manager of the Harrison Div. **Frederick B. Seel**, manager of engineering at Holyoke, becomes general manager, Holyoke Div.

Steven L. Anderson was made western region market analyst of **SKF Industries Inc.**, Philadelphia.

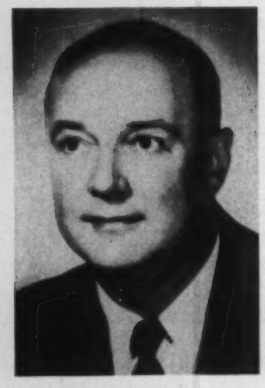
American Tool Works Co., Cincinnati, elected **Robert S. Alter** chairman to succeed **James B. Doan**, retired. **John C. Hussey Jr.** was named sales manager; **Glenn R. Kraus** assistant sales manager. **J. Coleman Hussey Sr.** retires as vice president-domestic sales manager.

Ralph W. Updegraff was made general factory manager, Bearing & Rock Bit Divisions, **Timken Roller Bearing Co.**, Canton, Ohio. **Robert L. Sisson** was made general superintendent of the Canton and Gambrinus, Ohio, bearing factories, succeeding Mr. Updegraff. **Joseph L. Duzan** was made assistant to Mr. Updegraff; **James E. O'Connor** superintendent, Gambrinus bearing factory, succeeding Mr. Sisson.

Walter G. Tharl was promoted to market analyst of **Bunker Hill Co.**, San Francisco. He was division controller of the Sales and Fabrication and Chemical Products Division in Seattle.

Robert L. Feagins was made southern regional manager, Atlanta, for **Consolidated Systems Corp.**, subsidiary of Consolidated Electrodynamics Corp.

Moxie S. George was named manager of tin plate and export sales of **Inland Steel Co.**, Chicago. He



W. J. STEPHENS

D. C. ROSCOE

sales appointments at Bethlehem Steel

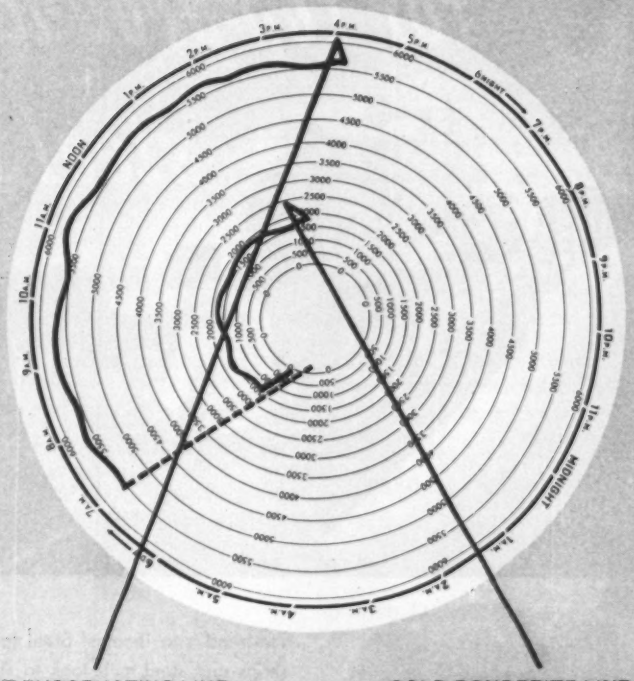
ROBERT S. ALTER

JOHN C. HUSSEY JR.

American Tool Works executives

STEAM RECORDERS SHOW

$25,000 a year savings



HOT PHOSPHATING LINE—
5742 lbs. steam per hour

COLD BONDERITE LINE—
1561 lbs. steam per hour

. . . WITH COLD BONDERITE SYSTEM

A manufacturer of household appliances decided to find out for himself! Steam recorders were hooked to two identical 5-stage phosphating lines—one using conventional hot solutions and the other line using the Cold Bonderite System.

Steam consumption on the "hot" line measured 5742 pounds per hour; the Cold Bonderite line used only 1561 pounds per hour. A difference of 4181 pounds, or *72.8%!*

Converted to dollars, the manufacturer estimates that Cold Bonderite on the one line, operating 8 hours per day, will save $25,878 per year.

He is changing his other phosphating lines to the Cold Bonderite System as quickly as he can!

Cold Bonderite Systems operate at temperatures from 40 to 75° below conventional phosphate systems for surface treatment of metals. Coatings are of highest quality. Savings are *automatic.* Balanced formulation permits the use of accelerated solutions, easy to operate and control. You can choose between zinc or iron phosphates. Spray or immersion application to fit your production requirements.

The changeover to a Cold Bonderite System is simple and quick. Act now. You can have it installed and working to save you money by this time next week.

Call in your Parker representative today!

Since 1914—leader in the field

Parker Rust Proof Company

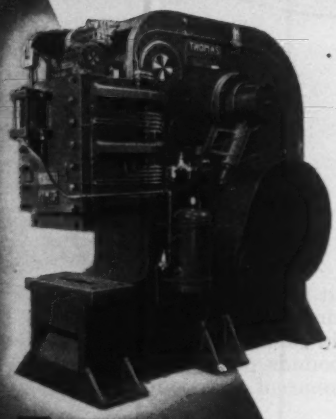
2158 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base	BONDERITE and BONDERLUBE aids in cold forming of metals	PARCO COMPOUND rust resistant	PARCO LUBRITE—wear resistant for friction surfaces	TROPICAL—heavy duty maintenance paints since 1883

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

for top-production steel fabricating

1



2

. . . the trend is to Thomas! Steel fabricators, shipyards, railroad car shops and steel mills look to Thomas for everyday dependability and ultimate economy in punching, spacing, shearing and bending machinery. Available in various sizes and tonnages to meet individual requirements. Illustrations show:

(1) *Beam Punch and Motorized Indicator Spacing Table for beam, angle, channel and cover plate punching without layout*

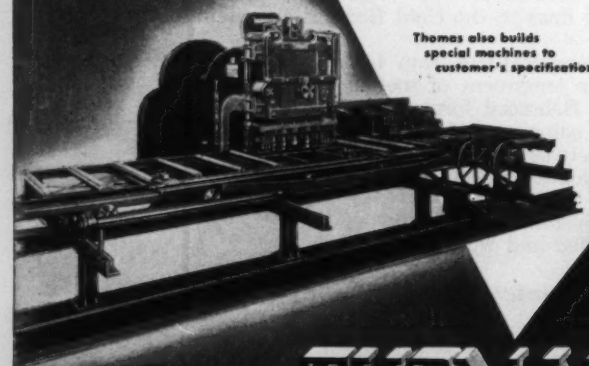
(2) *All-Steel Vertical Punch or Shear for heavy-duty work*

(3) *Plate Duplicator for rapid, economical plate punching*

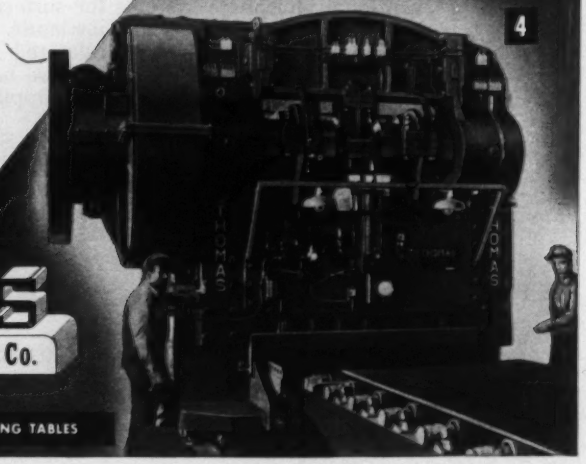
(4) *Heavy-Duty Mill Type Plate Shear, capacity 1¼" by 6' stainless 120,000 psi*

THE TREND IS TO THOMAS

Thomas also builds special machines to customer's specifications



3

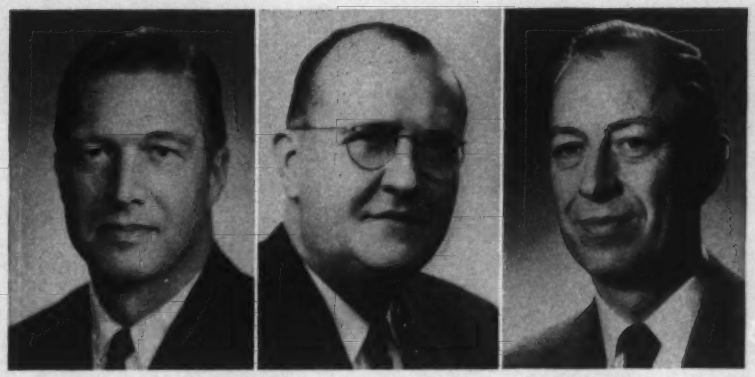


4

THOMAS

MACHINE MANUFACTURING CO.

PUNCHES · SHEARS · PRESSES · BENDERS · SPACING TABLES



HENRY P. RANKIN JR. EDWARD K. WALDSCHMIDT J. G. WILSTERMAN

Republic Steel Corp. sales positions

succeeds **Ervin J. Sanne**, retired. Mr. George was manager of railroad products sales.

Henry P. Rankin Jr. was made assistant general sales manager, **Republic Steel Corp.**, Cleveland, to succeed **J. V. Burley**, retired. **Edward K. Waldschmidt** succeeds Mr. Rankin as sales manager, Bar Div. **J. G. Wilsterman** succeeds **J. P. Distler**, retired, as sales manager, Wire Div., Chicago. **J. R. Fraine**, assistant manager, Wire Div., retired.

Regis F. Dunlavey was made assistant superintendent, Finishing Dept., at the Buffalo plant of Republic Steel Corp.

Edward S. Weyl fills the new post of director of business planning for **International Resistance Co.**, Philadelphia.

Thomas A. Lyons Jr. joined the Steel Div. of **Quaker Chemical Products Corp.**, as field process engineer in the Pittsburgh area.

Frank J. Mangus Jr. was promoted to technical superintendent; **William A. Griffith** to senior process engineer at the Niagara Falls, N. Y., plant of Great Lakes Carbon Corp.

Charles S. Warner was made field manager-Chicago area by **Kasle Steel & Aluminum Co.**

Lowell A. Kintigh, assistant chief engineer at Oldsmobile Div., was named chief engineer at **Buick Motor Div.**, Flint, Mich., General Motors Corp. He succeeds **Oliver K. Kelley**, named technical assistant to the general manager of GM's new Defense Systems Div. which has headquarters at the GM Technical Center.

John O. Brown was named manager of the new Birmingham district office of **I-T-E Circuit Breaker Co.**

Elmer F. Twyman retired as senior vice president, **Yale & Towne Mfg. Co.**, New York. His responsibilities for domestic and foreign material handling equipment operations have been assigned to **John A. Baldinger**, vice president, with headquarters at the corporate executive offices in New York. Mr. Baldinger was vice president - general manager, Yale Materials Handling Div., in Philadelphia, and is succeeded by **Clyde R. Dean** as general manager of the division. **Norman R. Amberg**, former works manager, was promoted to plant manager of the Philadelphia plant, Yale Materials Handling Div. **Thomas H. Olson**, assistant works manager, succeeds Mr. Amberg.

MEN OF INDUSTRY

Arthur J. Briggs was promoted to vice president-marketing, **Continental-Diamond Fibre Corp.**, Newark, Del., subsidiary of Budd Co. He was vice president-sales. **Harold Moyer**, former Philadelphia district office manager, was promoted to field sales manager.

Edward J. Higgins succeeds the late **Ludwig C. Boos** as general manager, International Div., **United States Rubber Co.**, New York.

Thomas W. Allison was appointed vice president-marketing and sales for **Aluminum Foils Inc.**, Jackson, Tenn.

Dr. Rush F. McLeary was elected to the new post of vice president-research and development, **Jefferson Chemical Co. Inc.**, Houston.

Merton D. Robinson was made district sales manager for New England, **Precision Drawn Steel Co.** He is at Meriden, Conn.

Norman C. Drechsel was made Boston district office manager, **Niagara Machine & Tool Works.**

Rudy R. Redmont was appointed president, **Abbott-Redmont Thinlite Corp.**, New York, subsidiary of Abbott Glass Co. Inc.

James A. D'Errico was made assistant sales manager, **Huck Mfg. Co.**, with offices at the western branch facility, Los Angeles.

Vincent K. Alexander was named vice president, **Manheim Mfg. &**

(*Please turn to Page* 134)

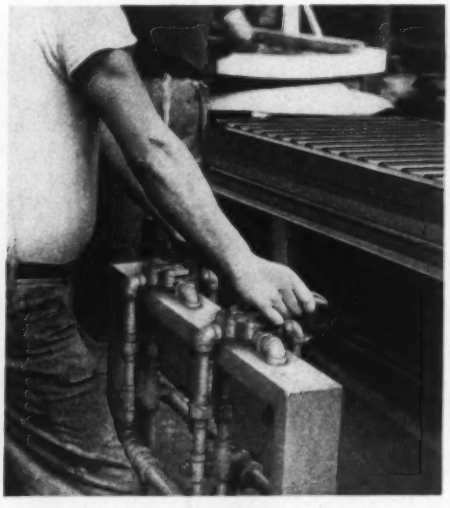
JOHN A. BALDINGER CLYDE R. DEAN NORMAN R. AMBERG

Yale & Towne Mfg. operations posts

Shipping end of new Logan conveyor at Weirton Steel Co., division of National Steel Corp., Weirton, W. Va.

Logan *Plant-Dynamation* speeds

Line weighing station of the Weirton system is a Logan-installed hydraulic lift which operates recording scales. Custom cut bundles weigh in at 1,500 lbs. to 10,000 lbs. Gravity rollers at the series of work stations are succeeded by live roller sections which hurry the bundles on to shipping. In the shipping area, gravity sections take over once more.



Hand-controlled hydraulic brakes and electric start-stop buttons give conveyor sections full flexibility of pace. Constantly varying size of bundles and differences of work time for different steps dictated this important design feature.

Now each man bundles steel 15 times faster. A crew of seven men now wraps and bands over four times as much custom-sheared strip steel as 26 men could before the system was installed. Steel moves from shearing area on a series of live roller sections separately controlled by crane operators (left, above). Then crane places stacks of steel on wrappings spread over first of a series of gravity roller sections. Gravity rollers convey bundles through banding area (right, above). Then, through weighing, hydraulic line alongside gravity conveyors operates control brakes at work stations.

production at Weirton Steel Co.

Weirton Steel Company's big new Logan conveyor line shows what conveyor design *can accomplish*. The 375-ft. system is made up of successive sections of Logan electric and gravity rollers teamed with overhead cranes to match the variable pace of Weirton's strip steel bundling operation. The result: seven men now easily prepare four times as much steel for shipping as 26 men could before! Details of the installation and Logan's Plant Dynamation technique are shown and described on these pages.

Logan conveyor design helps harness ***all*** *the work-power potential of your plant*

A major key to output for any plant is the unique pattern and pace of its potential work flow.

To exploit this "dynamic principle" of a plant—to put *all* its productive energy to work—*one right* custom-designed conveyor is required.

The Logan technique of Plant Dynamation insures this one right system for your plant. The Logan engineer works with you through a complete analysis; then section by section he designs and specifies the complete conveyor *dictated* by the dynamics of your operation. Your plant may call for maximum or partial automation.

Over the half century in which assembly-line production itself has grown up, Logan engineers have proved and extended their exclusive Plant Dynamation technique. For example, in your area "The Man from Logan" is one of a group with an average of fourteen years of this vital experience.

Only a complete-line conveyor company like Logan has the wide range of products to back up Plant Dynamation. To give your plant its *one right* system, the Logan engineer specifies freely from one of the industry's most comprehensive lines of conveyor equipment. The Logan engineer commands five distinct power modes: gravity, electricity, hydraulics, pneumatics, and control electronics.

"The Man from Logan" stationed near you is quickly available. This qualified specialist in Logan Plant Dynamation works directly with your engineers through design and installation to smooth operation. Write or phone today for a conference on the dynamic possibilities of your plant.

Logan Conveyors

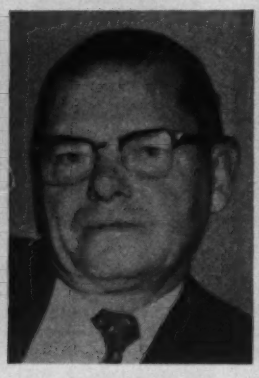
LOGAN CO., 535 CABEL ST., LOUISVILLE 6, KY.

ROBERT R. RHODEHAMEL
Cone Automatic gen. mgr.

JOHN F. OETTINGER
Pacific Alloy works mgr.

EDWIN A. MUNSCHAUER JR.
Niagara Machine research dir.

EDWIN H. BURKE
Morgan Engineering v. p.



EARL G. SKAVDAHL
Revere manufacturing post

ALBERT F. WIKE
Addressograph-Multigraph post

(*Concluded from Page* 131)

Belting Co., Manheim, Pa. He continues as sales manager.

Edwin H. Burke was made vice president-engineering, **Morgan Engineering Co.**, Alliance, Ohio. He was director of engineering in charge of engineering designs of crane and steel mill equipment, proposal and research and development.

Frederick A. Fielder was named general manager of the new Industrial Equipment Div. formed at Eddystone, Pa., by **Baldwin-Lima-Hamilton Corp.** Mr. Fielder was vice president and general manager at Loewy-Hydropress Div., New York. **Perry A. White**, a vice president, who was general manager of the Eddystone Div., moves to the corporate offices in Philadelphia. The new division manufactures products formerly made by the Eddystone Div., and certain of the product lines previously made at B-L-H Hamilton Div., as well as Loewy-Hydropress products.

Earl G. Skavdahl was made assistant general manufacturing manager of **Revere Copper & Brass Inc.**, New York. He was works manager of the Michigan Div. in Detroit, and is now in New York. **George F. Ewald** succeeds Mr. Skavdahl at Detroit. **Ingeman T. Jensen** was made assistant works manager there, continuing as production manager of the division.

Albert F. Wike was made sales research director, **Addressograph-Multigraph Corp.**, Cleveland. He was electronics sales manager.

A. L. Scharff was made general manager, **Magnetic Research Corp.**, Hawthorne, Calif. He is succeeded as production manager by **Walter L. Allen.**

William C. Butler was made sales manager-Cleveland district, Supply Div., **United States Steel Corp.** He replaces **Wallace W. Clevenger**, promoted to assistant to district manager.

Robert R. Rhodehamel was made general manager, **Cone Automatic Machine Co. Inc.**, Windsor, Vt. He was vice president, Patt Bros. Machinery Co., Willoughby, Ohio, and previously was vice president-general sales manager, National Acme Co., Cleveland.

John F. Oettinger was named works manager, **Pacific Alloy Corp.**, El Cajon, Calif., subsidiary of Electric Steel Foundry Co.

Edwin A. Munschauer Jr. was named director of research, **Niagara Machine & Tool Works**, Buffalo. He continues as treasurer of the company. He had been service manager since 1941. **H. Stanton Cheyney** becomes service manager.

George H. Weaver was named chief engineer for Worksaver, Warehouser, and hand trucks, **Yale Materials Handling Div.**, Philadelphia, Yale & Towne Mfg. Co. He succeeds **Ralph Heberly**, appointed a special project engineer in new product development. **Robert P. Crease** was named chief engineer of gas, LP-gas and diesel powered trucks for the division to succeed **R. F. Brackin**, promoted to assistant director of engineering.

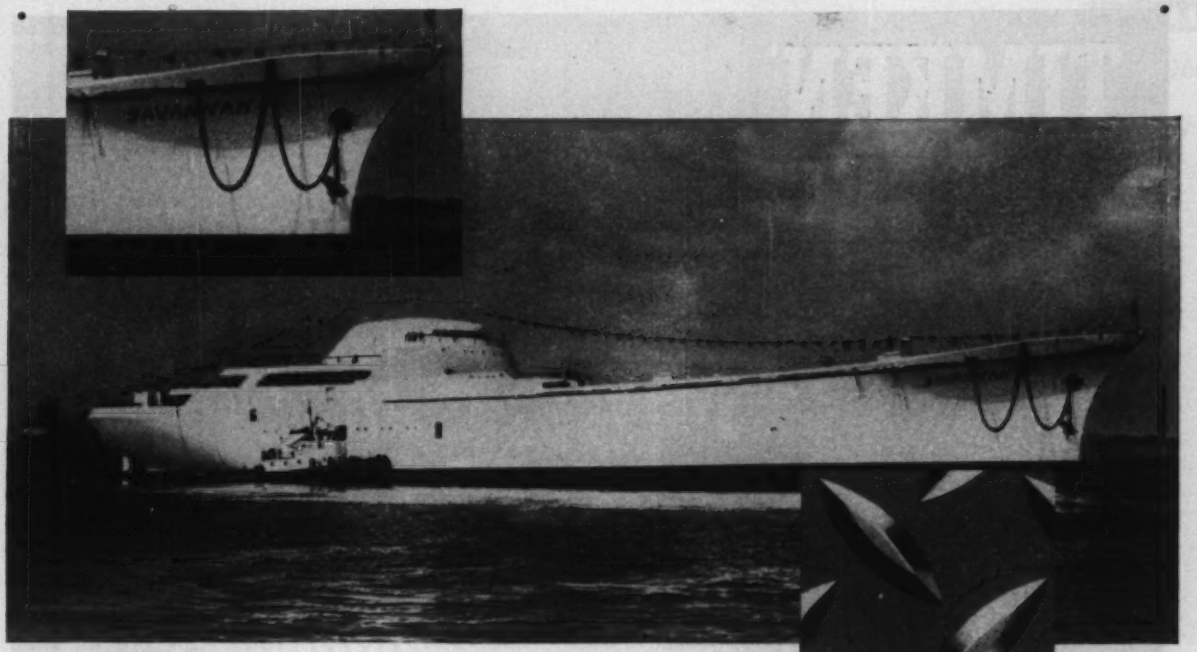
Paul A. Ketchum was appointed vice president-glass sales, Merchandising Div., **Pittsburgh Plate Glass Co.**, Pittsburgh. **Howard J. Mather** was named vice president-industrial sales, Paint Div.

Robert D. Gaertner was appointed manager of **Kleen-Stik Products Inc.**'s newly formed Industrial Products Div., Chicago plant.

Charles T. Haist was made western regional manager, San Francisco, for **General Electric Co.**'s Computer Dept.

Carl W. Fetter was made assistant district sales manager in Detroit for **Youngstown Sheet & Tube Co.** He succeeds **J. D. MacPherson**, retired.

Republic Steel Corp.'s **Berger Div.** named **Ralph W. Sponseller Jr.** Detroit branch manager. **Donald P. Gordon** was made manager of locker sales in Canton, Ohio, succeeding Mr. Sponseller. **Gerald Haynam** succeeds Mr. Gordon as Minneapolis district sales manager.



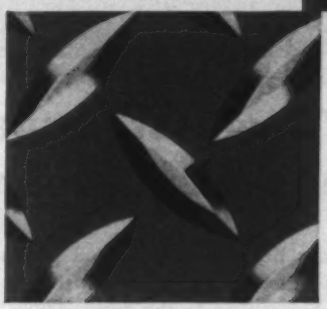
Safety Is Sure . . . *on the N.S. Savannah*

A. W. Super Diamond floor plate assures safe footing on new atomic-powered cargo ship

Floor plate on the N.S. Savannah, world's first nuclear-powered merchant ship—is Alan Wood Super Diamond. Described as "the safest ship in the world," the Savannah, built by New York Shipbuilding Corporation, Camden, N.J., was designed and constructed to meet the highest safety standards of several government agencies, including the Maritime Administration and the AEC.

A.W. Super Diamond is installed throughout the ship to provide officers and crew the safest footing available. This heavy duty floor plate will last for years . . . is easy to clean . . . easy to fabricate . . . easy to match.

Specify A.W. Super Diamond for your "safety-sure" flooring. Write for Bulletin SD-S12.



ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

DISTRICT OFFICES: Philadelphia • New York • Los Angeles • Boston • REPRESENTATIVES: Atlanta • Buffalo Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada—A. C. Leslie & Co., Ltd.

"Toughest" inspection in the steel business assures you utmost uniformity in Timken® forging steels

You can always be sure your forged products made from Timken® steel forging bars will have uniform quality. One big reason is the rigid, 100% Final Inspection we give every bar. Examination is so thorough that our Inspection Department is known as the toughest in the steel business.

You save money, too, because of the uniform quality of Timken steel. It is remarkably uniform in structure, chemistry and dimension from heat to heat, bar to bar, order to order. And because we handle each order individually, we can target our procedures to *your* end-use requirements. You don't have to interrupt your operations to make costly equipment adjustments.

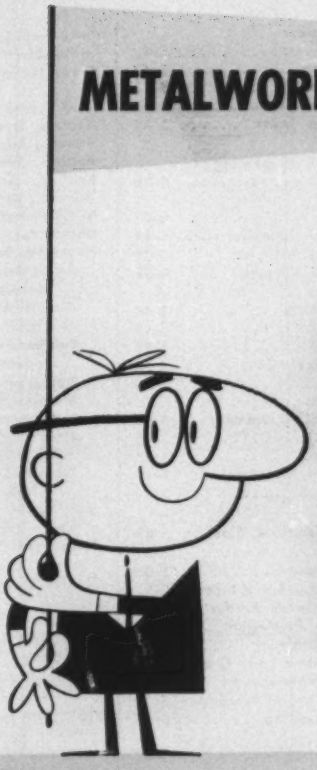
Important to our operations is a new Metallurgical Research Center, one of industry's most modern. Its facilities range all the way from an experimental melting laboratory to one of the industry's finest technical libraries. It is designed not only to improve our own products but also to solve customer problems—your problems.

When you buy Timken steel you get: 1) *Quality that's uniform from heat to heat, bar to bar, order to order.* 2) *Service from the experts in specialty steels.* 3) *Over 40 years experience in solving tough steel problems.*

For the most from your modern forging operations, specify Timken steel forging bars. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

TIMKEN ALLOY STEEL AND SEAMLESS TUBING ARE AVAILABLE FROM WAREHOUSE STOCKS IN 44 CITIES IN THE UNITED STATES

STEEL
JANUARY 4, 1960



FACTS and FIGURES

This twelfth annual edition of Metalworking Facts & Figures will help you all year. It's a good place to get data on production, prices, earnings, labor, and many other figures in metalworking—the world's largest industry.

If you'd like to have a complimentary copy of this 48 page reference section, write to Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

Copyright, The Penton Publishing Co., Cleveland 13, Ohio.

Air Conditioning Equipment S-26
Air Handling Equipment ... S-26
Air Washers ... S-26
Aircraft, Civil ... S-36
Aircraft Engines, Civil ... S-36
Alloy Steel Distribution S-10, S-11
Alloy Steel Production ... S- 9
Aluminum:
  Castings ... S-14
  Prices ... S-19
  Production, Primary ... S-22
  Production, Secondary ... S-22
  Wrought Products ... S-22
Antimony:
  Consumption ... S-22
  Imports ... S-22
  Prices ... S-19
  Production ... S-22
Appliances, Home ... S-30, S-31, S-32, S-33
Arcwelding Sets ... S-29
Automobiles:
  Exports ... S-35
  Imports ... S-35
  Production ... S-35
  Replacement Parts ... S-35
  Scrappage ... S-35

Backlogs, Manufacturing ... S-43
Barrels and Drums, Steel ... S-15
Batteries, Shipments ... S-37
Bauxite: Imports, Production S-22
Bearings, Imports ... S-29
Bedsprings and Mattresses S-31
Bicycles Shipped ... S-35
Bituminous Coal ... S-47
Blowers ... S-26
Boilers, Steel Power ... S-28
Brass:
  Ingot Shipments ... S-20
  Prices ... S-19
Bronze Prices ... S-19
Building Cost Index ... S-48
Burners:
  Conversion, Gas ... S-31
  Oil ... S-30
Bus Production ... S-37
Business:
  Failures and Liabilities ... S-44
Businesses:
  In Operation ... S-44
  New Incorporations ... S-44

Cabinets, Steel Kitchen ... S-32
Cans, Metal ... S-15
Carbon Steel Distribution S-10, S-11
Carloadings, Freight ... S-44
Castings:
  Aluminum and Aluminum-base Alloy ... S-14
  Copper and Copper-base Alloy ... S-14
  Gray Iron ... S-12
  High Alloy ... S-13
  Iron and Steel ... S-13
  Lead and Lead-base Die ... S-14
  Magnesium and Magnesium-base Alloy ... S-14
Castings (continued)
  Malleable Iron ... S-12
  Nonferrous ... S-14
  Steel ... S-13
  Zinc, Zinc-base Alloy ... S-14
Chrome Ore ... S-23
Cleaners, Standard Vacuum S-32
Closures:
  Commercial ... S-15
  Home Canning ... S-15
Coal:
  Bituminous Consumption ... S-47
  Bituminous Output ... S-47
  Industrial Stocks ... S-47
Coal Chemical Prices ... S-18
Cobalt Prices ... S-19
Coffeemakers, Electric ... S-32
Coke Prices ... S-16
Coke Production ... S-46
Conduit and Fittings ... S-28
Construction:
  Cost Index ... S-48
  Equipment ... S-28
  New Houses ... S-48
  New Plant, Equipment ... S-48
  Put In Place ... S-48
  Valuation ... S-48
Consumer Price Index ... S-39
Containers and Closures:
  Commercial ... S-15
  Metal Cans ... S-15
  Steel Barrels, Drums, Pails S-15
Control Apparatus, Industrial S-26
Convectors ... S-31
Conversion Burners ... S-31
Copper:
  Castings ... S-14
  Consumption in U. S. ... S-20
  Exports ... S-20
  Fabricators' Statistics ... S-20
  Imports ... S-20
  Prices ... S-19
  Production ... S-20
Corn Poppers, Electric ... S-32
Corporate Finances ... S-45
Cost-of-living Index ... S-39
Crowns, Shipments ... S-15

Debt, National ... S-45
Deep Fat Fryers ... S-32
Diecastings:
  Aluminum ... S-14
  Copper ... S-14
  Lead ... S-14
  Zinc ... S-14
Diodes, Semiconductors ... S-34
Dishwashers, Electric ... S-32
Disposers, Waste Food ... S-33
Distribution:
  Alloy Steel ... S-10, S-11
  Carbon Steel ... S-10, S-11
  Finished Steel ... S-10
  Stainless Steel ... S-10, S-11
Dividends, Corporate ... S-45
Drums, Steel ... S-15
Dryers, Clothes ... S-33
Duct Heaters ... S-31

Durable Goods:
  Backlogs ... S-43
  Inventories ... S-43
  New Orders ... S-43
  Production (Sales) ... S-43
  Production Index ... S-39

Earthmoving, Excavating Equipment ... S-28
Electricity:
  Output ... S-47
  Production Capacity, U. S. S-47
Electrodes, Welding ... S-29
Electronic Equipment ... S-34
Employment:
  Metalworking ... S-40
  Steel ... S-41
  Total U. S. ... S-41
Engines, Diesel, Gas, Gasoline ... S-29
Expenditures:
  New Plant, Equipment ... S-48
  U. S. ... S-45
Exports, Auto ... S-35
Exports, Iron and Steel ... S- 7
Exports, U. S. ... S-44

Fabricated Structural Steel ... S-48
Fans ... S-32
Farm Equipment ... S-38
Federal Reserve Board Indexes:
  Durable Goods Production S-39
  Industrial Production ... S-39
  Metal Fabricating ... S-39
  Nondurable Goods Output S-39
  Primary Metals ... S-39
Ferroalloys, World Production S- 7
Ferrous Production ... S- 9
Finances:
  Corporate ... S-45
  U. S. ... S-45
Fluorspar ... S-46
Foreign Trade ... S-44
Forgings, Steel ... S- 9
Foundry Equipment, Sales ... S-27
Freezers, Electric ... S-32
Freight Carloadings ... S-44
Fuel ... S-46, S-47
Fuel Oil Consumption ... S-47
Furnaces:
  Duct ... S-31
  Floor and Wall ... S-30
  Forced Air ... S-30
  Gravity Air-Flow ... S-30
  Industrial ... S-28
  Warm Air ... S-30
Furniture, Metal Household ... S-31

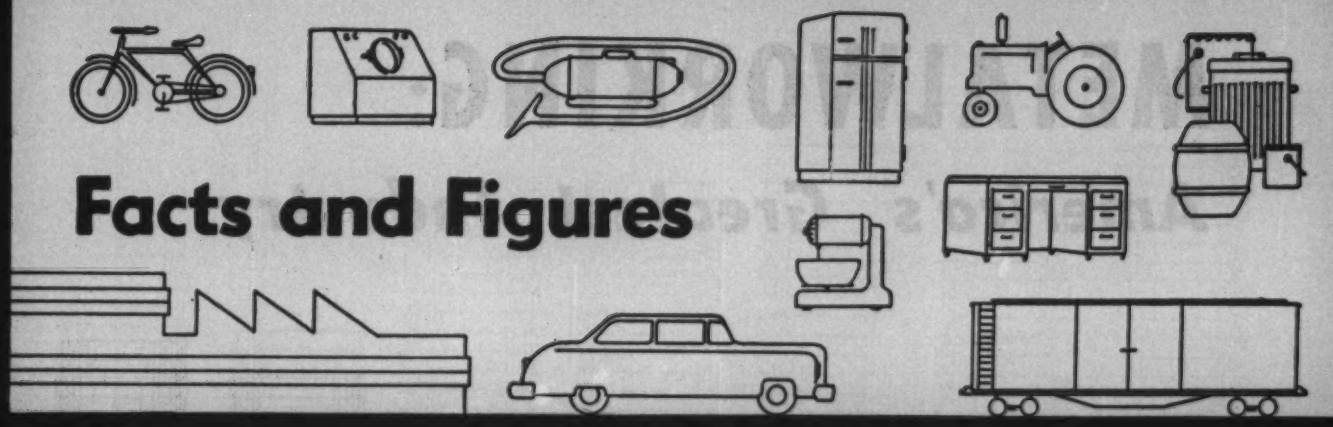
Gas, LP:
  Consumption in Steel Industry ... S-47
Gas, Natural:
  Consumption in Steel Industry ... S-47
  Sales ... S-47
Gears ... S-27
Generators ... S-27
Gray Iron Castings ... S-12
Grills, Electric ... S-32
Gross National Product ... S-45

Heat Treating ... S-27
Heaters, Duct ... S-31
Heaters, Electric, Portable ... S-32
Heaters, Electric Water ... S-33
Heaters, Gas Water ... S-33
Heaters, Unit ... S-26, S-31
Hi-Fi Components ... S-34
Hot Plates ... S-32
Hours Worked:
  Agricultural Machinery and Tractors ... S-42
  Aircraft and Parts ... S-42
  Electrical Appliances ... S-42
  Fabricated Structural Metal Products ... S-42
  Iron and Steel Foundries ... S-42
  Metalworking Industry ... S-40
  Metalworking Machinery S-42
  Motor Vehicles and Equipment ... S-42
  Primary Smelting and Refining of Nonferrous Metals ... S-42
  Steel Industry ... S-41
Household Equipment ... S-30, S-31, S-32, S-33
Houses Started ... S-48

Imports:
  Automobiles ... S-35
  Bearings ... S-29
  Iron and Steel ... S-6, S- 7
  U. S. ... S-44
Incinerators, Gas Fired ... S-31
Income, Corporate ... S-45
Income, National ... S-45
Induction Heating Equipment S-28
Industrial Heating Equipment S-28
Industrial Production Index S-39
Industrial Supplies and Machinery ... S-27
Industrial Trucks ... S-26
Inventories, Manufacturing ... S-43
Iridium Prices ... S-19
Iron Ore:
  Consumption ... S-46
  Imports ... S-46
  Lake Shipments ... S-46
  Prices ... S-16
  Production ... S-46
  Stocks ... S-46
Iron and Steel:
  Exports ... S- 7
  Imports ... S-6, S- 7
  Prices ... S-17
  World Production ... S-6, S- 7
Ironers, Standard Size ... S-32
Irons, Electric Flat ... S-32

Kitchen Cabinets, Steel ... S-32

Labor ... S-40, S-41, S-42
Labor Turnover ... S-42
Labor Union Membership ... S-42



Facts and Figures

Lamps (Electric Bulbs) S-31
Lead:
  Consumption S-21
  Diecastings S-14
  Prices S-19
  Production S-21
Locomotives S-37

Machine Tools, New Orders:
  Forming Types S-25
  Metal Cutting Types ... S-24
Machine Tools, Shipments:
  Forming Types S-25
  Metal Cutting Types S-24
Machine Tools, Used S-29
Machinery:
  Backlogs S-43
  Inventories S-43
  New Orders S-43
  Production (Sales) S-43
Machinery, Metalworking .. S-25
Magnesium:
  Castings S-14
  Ingots S-23
  Prices S-19
  Wrought Products S-22
Malleable Iron Castings ... S-12
Manganese S-23
Manufacturers':
  Backlogs S-43
  Inventories S-43
  New Orders S-43
  Production (Sales) S-43
Material Handling Equip. .. S-26
Mattresses and Bedsprings S-31
Metalworking, Comparison with Other Industries ... S- 5
Metalworking Machinery .. S-25
Metalworking Sales ...S-4, S- 5
Molybdenum S-23
Motor Vehicles S-35, S-37
Motors:
  Electric S-27
  Outboard S-29

New Orders, Manufacturers' S-43
Nickel Prices S-19
Nickel Production S-23
Nickel Silver Prices S-19
Nondurable Goods Production Index S-39
Nonferrous Metals:
  Prices S-19
  Production S-20, S-21, S-22, S-23

Office Machines S-27
Oxygen, Consumption S-47

Pails, Steel S-15
Partitions, Metal Toilet ... S-31
Payrolls, Steel S-41
Phonograph Sales S-34
Phosphor Bronze Prices S-19
Pig Iron:
  Capacity ..... S- 8
  Consumption S-46
  Prices S-17
  Production ..... S- 8
  Stocks S-46
  World Production ..... S- 7
Plant, Equip. Expenditures .. S-48
Platinum Prices S-19
Plumbing Fixtures S-31
Power S-46, S-47
Price Composites:
  Finished Steel S-17
  Pig Iron, Basic S-17
  Pig Iron, Foundry S-17
  Pig Iron, Malleable S-17
  Scrap, Steelmaking S-17
Price Indexes:
  Consumer S-39
  Steel, BLS S-16
  Wholesale S-39
Prices:
  Coke, Beehive S-16
  Coke, Oven Foundry ... S-16
  Finished Steel S-16
  Iron Ore, Lake Superior . S-16
Prices, Average Monthly:
  Chicago S-18
  Coal Chemicals S-18
  Eastern Pennsylvania ... S-18
  Pittsburgh S-18
Prices, Nonferrous:
  Aluminum S-19
  Antimony S-19
  Brass S-19
  Bronze S-19
  Cobalt S-19
  Copper S-19
  Iridium S-19
  Lead S-19
  Magnesium S-19
  Nickel S-19
  Platinum S-19
  Silver S-19
  Tin S-19
  Zinc S-19
Production:
  Alloy Steel ..... S- 9
  Durable Goods S-39, S-43
  Ferrous .....S- 9
  Industrial, Total S-39
  Metal Fabricating S-39
  Nondurable Goods S-39
  Primary Metals S-39
  Stainless Steel ..... S- 9
  Steel, By Months ..... S- 8
  Steel, By Years ..... S- 8
  World, Steel ..... S- 6
Pumps:
  Farm S-38
  Industrial S-26
Purchasing Power of Dollar .S-45

Radiators S-31
Radios S-34
Railroad Cars:
  Locomotives Put in Service S-37
  Orders, Freight, Passenger S-37
  Shipments—Freight, Passenger S-37
Ranges:
  Electric S-33
  Gas S-33
Raw Materials S-46, S-47
Receiving Tubes S-34
Rectifiers, Semiconductor ... S-34
Refractories S-46
Refrigeration Equipment ... S-26
Refrigerators, Electric S-33
Resistance Welding Equipment S-29
Revenues, U. S. S-45

Sales (Production), Manufacturing S-43
  Metalworking Industry .. S- 4
Scrap:
  Consumption by Industries S-46
  Exports, Imports S-46
  Iron and Steel S-46
  Prices S-17, S-18
Screw Machine Products ... S-27
Shavers, Electric S-32
Shipbuilding:
  Merchant S-36
  Naval S-36
Shipments of Steel Products S-10, S-11
Silver Prices S-19
Silver Production S-23
Skillets, Electric S-32
Stainless Steel:
  Distribution S-10, S-11
  Production ..... S- 9
Stampings, Shipments S-29
Steel:
  Alloy Distribution ...S-10, S-11
  Alloy Production ..... S- 9
  Capacity ..... S- 8
  Carbon Distribution .S-10, S-11
  Castings S-13
  Consumption for Metal Cans S-15
  Fabricated Structural ... S-48
  Finished, Distribution S-10, S-11
  Ingots and Castings .... S- 8
  Price Index, BLS S-16
  Prices S-16, S-17, S-18
  Production ..... S- 8
  Shipments S-10, S-11
  Stainless, Distribution S-10, S-11
  Stainless, Production .... S- 9
  Tool Steel ..... S- 9
  World, Production ..... S- 6
Stokers S-31
Stoves:
  Coal and Wood, Cooking S-32
  Domestic Heating S-30
  Oil, Cooking S-32

Taxes, Corporate S-45
Television:
  Picture Tubes S-34
  Sets S-34
Tin:
  Consumption S-23
  Prices S-19
  Production S-23
Tin (continued)
  Stocks S-23
  World S-23
Titanium Production S-21
Toasters, Electric S-32
Tool Steel Shipments ..... S- 9
Tractors, Shipments ...S-28, S-38
Trade S-44
Trailers, Truck S-35
Transistors S-34
Transit Equipment S-37
Transportation ..S-35, S-36, S-37
Trucks, Industrial S-26
Trucktrailers S-35
Tubes:
  Receiving S-34
  Television Picture S-34
Tungsten S-23
Typewriters S-27

Unemployment S-41
Uranium S-23
U. S. Government:
  Debt S-45
  Expenditures S-45
  Revenues S-45

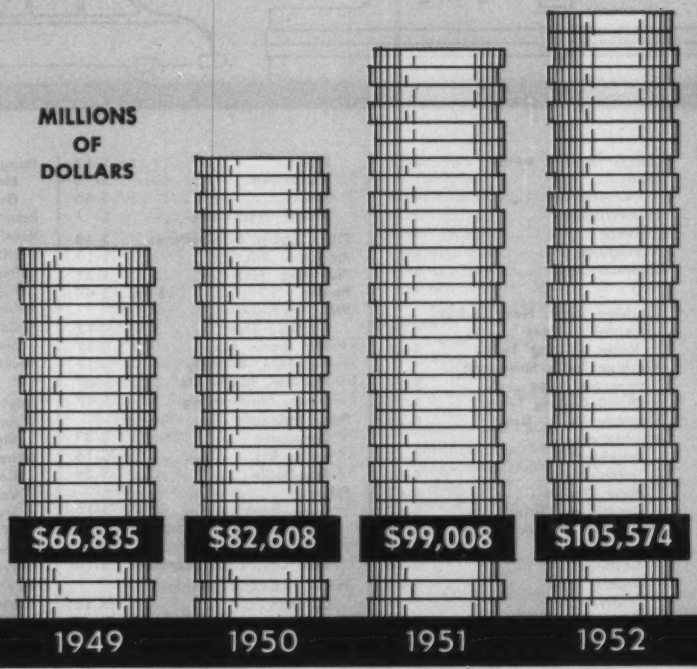
Vacuum Cleaners S-32

Waffle Irons, Electric S-32
Wages:
  Agricultural Machinery and Tractors S-42
  Aircraft and Parts S-42
  Electrical Appliances ... S-42
  Fabricated Structural Metal Products S-42
  Iron and Steel Foundries S-42
  Metalworking S-40
  Metalworking Machinery S-42
  Motor Vehicles and Equipment S-42
  Primary Smelting and Refining of Nonferrous Metals S-42
  Steel Industry S-40, S-41
Washer-Dryers S-32
Washers S-33
Washers, Air S-26
Water Heaters, Electric ... S-33
Water Heaters, Gas S-33
Water Systems, Domestic .. S-38
Welding Electrodes S-29
Welding Equipment S-29
Wholesale Price Indexes .. S-39
Windmills S-38
Work Stoppages S-40

Zinc:
  Castings S-14
  Consumption S-21
  Mine Production S-21
  Prices S-19
  Slab S-21

METALWORKING:
America's Greatest Industry

Manufacturers' sales in the metalworking industry reached a record $145 billion in 1959 despite the long strike in the steel industry in the last half. Sales in the first half were at an annual rate of $150 billion. The 1959 record is 18.5 per cent above the 1958 recession year level and 2.7 per cent above the previous record set in 1957. Data are from the Office of Business Economics, U. S. Department of Commerce, with 1959 estimated by STEEL.

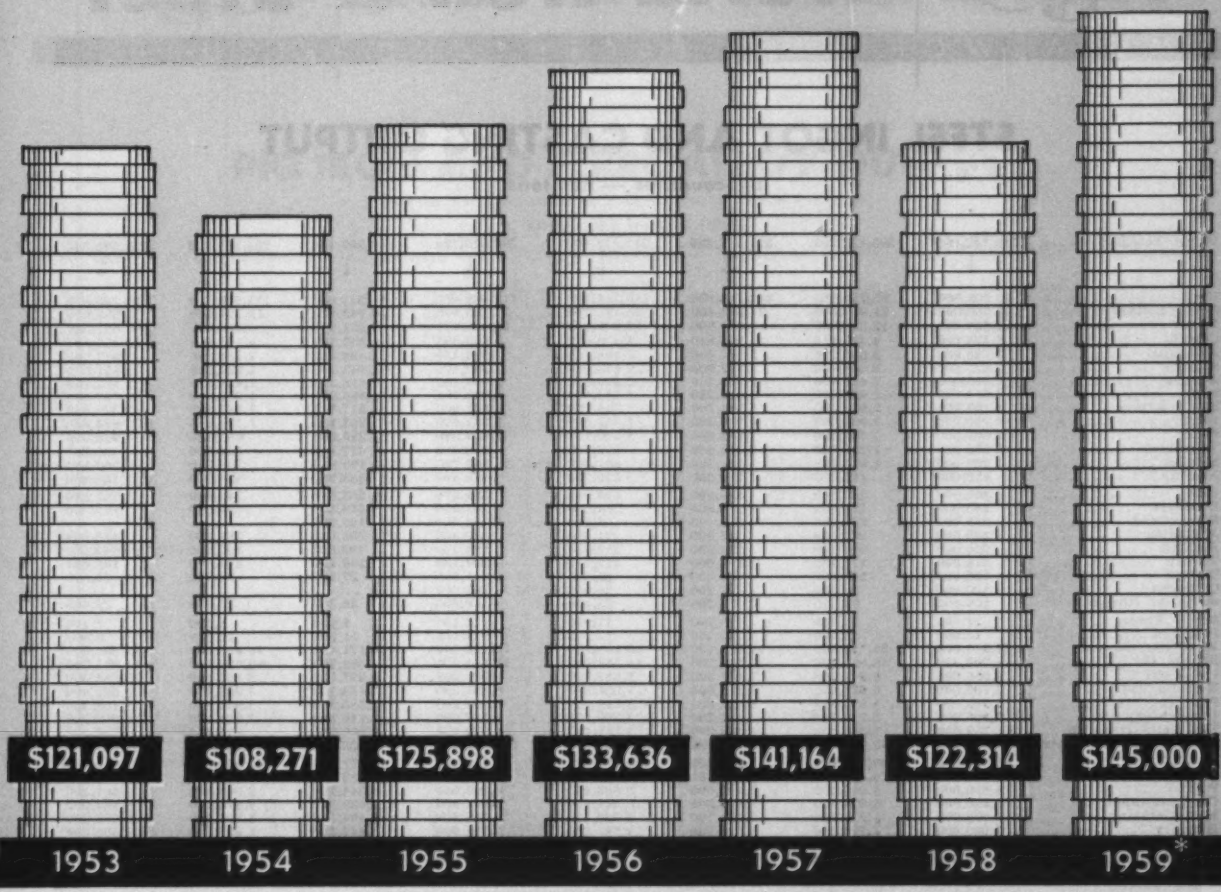


MANUFACTURERS' SALES IN METALWORKING INDUSTRY

(Millions of dollars—not adjusted for seasonal variation)

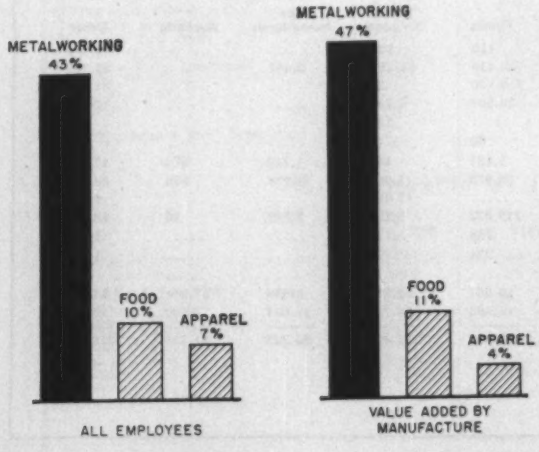
Standard Industrial Classifications	Primary Metals	Fabricated Metal Products	Machinery	Transportation Equipment	Instruments	TOTAL Metalworking Industry
1959*	27,100	20,700	53,700	39,400	4,100	145,000
1958	22,949	17,277	45,979	32,649	3,450	122,314
1957	27,852	18,442	50,920	40,000	3,950	141,164
1956	28,339	17,683	47,856	36,037	3,721	133,636
1955	26,468	16,275	41,392	38,402	3,361	125,898
1954	20,106	14,712	38,497	31,615	3,341	108,271
1953	23,841	15,203	41,634	37,028	3,391	121,097
1952	20,725	13,625	38,402	29,582	3,240	105,574
1951	23,087	13,655	33,989	25,606	2,671	99,008
1950	19,046	11,710	27,114	22,651	2,087	82,608
1949	14,743	9,160	22,369	18,717	1,846	66,835

*Estimates for 1959 are by STEEL. Figures for other years (except instruments) are from Office of Business Economics. Instrument figures through 1957 are from the Census of Manufactures. The 1958 and 1959 instruments figures are estimated by STEEL.



*Estimated.

HOW METALWORKING TOWERS OVER OTHER MANUFACTURING INDUSTRIES



Standard Industrial Classifications	TOTAL NUMBER PLANTS†	NUMBER OF EMPLOYEES‡	VALUE Added by Manufacture (000)‡
20. Food and Kindred Products....	42,374	1,688,228	$16,021,535
21. Tobacco Manufactures	627	88,086	1,233,184
22. Textile Mill Products	8,070	988,951	5,180,623
23. Apparel and Related Products..	31,372	1,264,308	5,968,807
24. Lumber and Wood Products....	41,484	645,792	3,295,567
25. Furniture and Fixtures	10,273	374,850	2,466,649
26. Pulp, Paper, and Products	5,004	565,874	5,642,384
27. Printing and Publishing	32,531	867,485	7,723,217
28. Chemicals and Allied Products	11,075	763,934	12,085,764
29. Petroleum and Coal Products..	1,381	185,562	3,008,896
30. Rubber Products	1,406	259,894	2,380,204
31. Leather and Leather Goods	4,845	361,945	1,869,630
32. Stone, Clay, and Glass Products	11,162	525,597	4,810,104
33. Primary Metal Industries.....	5,838	1,271,940	13,063,386
34. Fabricated Metal Products....	22,516	1,113,534	9,329,236
35. Machinery (except Electrical)..	25,601	1,707,450	15,442,481
36. Electrical Machinery	5,758	1,084,367	9,398,165
37. Transportation Equipment	5,348	1,900,319	18,235,153
38. Instruments & Related Products	3,142	307,207	2,725,616
Total Metalworking Industry	68,203	7,384,826	$68,194,037
39. Miscellaneous Manufactures....	17,010	665,067	4,637,704
Administrative and Auxiliary ..	4,187	474,256	.....

†1954 Census of Manufactures. ‡1957 Survey of Manufactures.

World Iron & Steel

METALWORKING FACTS AND FIGURES

STEEL INGOT AND CASTING OUTPUT

(By countries — net tons)

	1959a	1958	1957	1956	1955	1954	1953	1952
World Totals	318,792,000	295,886,701	321,192,336	311,412,468	296,670,799	245,965,184	258,121,823	232,598,243
U. S.	92,500,000	85,254,885	112,714,996	115,216,149	117,936,085	88,311,652	111,609,719	93,168,039
Great Britain	20,500,000	21,912,600	24,302,400	23,137,280	22,165,470	20,742,400	19,721,520	18,388,050
Japan	17,650,000	13,358,800	13,853,900	12,242,145	10,348,470	8,524,990	8,428,420	7,687,240
Canada	5,725,000	4,329,116	5,005,840	5,266,039	4,499,695	3,157,887	4,103,914	3,658,894
Australia	3,725,000	3,536,200	3,107,400	2,598,120	2,916,480	2,486,400	2,294,880	1,817,760
Sweden	2,925,000	2,638,900	2,767,900	2,673,080	2,338,600	2,048,200	1,960,200	1,857,900
Austria	2,650,000	2,633,400	2,765,700	2,290,580	2,005,300	1,818,300	1,411,528	1,162,700
India	2,560,000	2,027,100	1,920,200	1,946,660	1,908,704	1,838,975	1,687,280	1,767,580
South Africa	2,100,000	2,019,400	1,914,700	1,769,190	1,632,960	1,517,710	1,367,855	1,325,630
Brazil	2,000,000	1,900,000	1,760,400	1,515,660	1,282,600	1,263,130	1,117,930	982,630
Spain	2,000,000	1,704,300	1,482,600	1,370,160	1,334,300	1,210,000	983,730	998,030
Yugoslavia	1,350,000	1,233,500	1,156,300	977,740	886,600	677,600	566,500	486,200
Mexico	1,200,000	1,015,600	757,300	651,460	560,780	499,840	508,310	559,350
Norway	410,000	403,200	380,300	320,770	188,490	133,380	122,360	108,030
Chile	400,000	383,600	428,800	419,980	319,670	353,840	345,020	267,860
Denmark	285,000	281,400	288,800	264,550	261,250	219,360	198,410	194,000
Switzerland	285,000	275,000	259,000	188,500	183,000	165,350	.....	.....
Argentina	260,000	260,900	257,900	231,480	240,300	205,030	191,800	138,890
Finland	250,000	207,700	224,900	213,850	195,110	192,900	162,000	162,000
Turkey	215,000	176,100	194,000	212,740	207,230	186,290	179,670	168,650
Taiwan	135,000	120,000	97,000	69,445	44,090	27,560	22,050	16,530
Colombia	100,000	99,000	99,200	99,000	85,000	.....	.....	.....
Southern Rhodesia	100,000	93,000	77,200	58,420	49,600	36,380	27,560	39,680
South Korea	24,000	22,000	18,700	11,020	12,130	1,100	1,100	1,100
Pakistan	13,000	13,000	13,200	12,125	12,125	11,000	12,125	8,800
West Germany (b)	26,910,000	25,115,900	27,014,100	25,561,235	23,469,600	19,177,400	18,962,000	17,386,600
France (b)	16,000,000	16,099,100	15,540,200	14,768,615	13,851,200	11,689,700	10,996,700	11,953,700
Italy (b)	6,950,000	6,909,200	7,481,300	6,512,390	5,934,500	4,627,700	3,850,000	3,888,500
Belgium (b)	6,700,000	6,622,600	6,918,000	7,034,880	6,481,200	5,485,700	4,936,300	5,592,400
Saar (b)	3,975,000	3,812,900	3,820,600	3,719,160	3,481,500	3,085,500	2,952,400	3,108,300
Luxembourg (b)	3,950,000	3,724,700	3,850,300	3,809,550	3,547,500	3,110,800	2,924,900	3,302,200
The Netherlands (b)	1,750,000	1,584,800	1,306,200	1,157,415	1,076,520	1,020,360	945,450	753,500
Free World Totals	225,587,000	209,767,901	241,781,336	236,319,388	228,550,059	184,039,764	200,641,623	180,947,743
USSR	65,800,000	60,847,000	56,260,300	53,679,800	49,798,100	45,577,400	41,800,000	37,950,000
China	7,500,000	6,600,000	5,776,100	4,921,770	3,058,000	2,452,800	1,945,900	1,644,500
Poland	6,650,000	6,209,300	5,846,600	5,526,930	4,869,040	4,344,120	3,964,400	3,501,300
Czechoslovakia	6,625,000	6,073,700	5,694,500	5,381,430	4,921,400	4,699,200	4,873,000	4,169,000
East Germany	3,500,000	3,356,500	3,190,100	3,020,300	2,758,800	2,454,100	2,394,700	2,082,300
Hungary	1,900,000	1,794,500	1,515,700	1,560,860	1,791,900	1,640,100	1,697,300	1,535,600
Rumania	1,000,000	1,027,800	952,400	858,690	841,500	689,700	790,900	767,800
Bulgaria	230,000	210,000	175,300	143,300	82,000	68,000	14,000	.....
Iron Curtain Totals	93,205,000	86,118,800	79,411,000	75,093,080	68,120,740	61,925,420	57,480,200	51,650,500

(a) Estimated.
(b) Member of European Coal & Steel Community.

U. S. Steel Imports by Country of Origin

(Nine months, 1959—net tons)

	Belgium, Luxembourg	West Germany	Japan	France	United Kingdom	The Netherlands	Australia	Other
Ingots, blooms, slabs, and billets	4,399	8,602	358	415	123	.....	.....	21,255
Wire rods	26,924	111,329	82,228	52,419	24,792	2,681	.....	32,169
Concrete reinforcement bars	318,177	73,032	112,320	150,600	80	.....	.....	34,588
Carbon and alloy bars	75,709	22,253	12,198	23,508	2,762	.....	.....	12,731
Hollow bars and drill steel	.....	22	.....	.....	125	.....	.....	827
Skelp	.....	.....	114	66	.....	.....	.....	.....
Plates	27,186	42,229	66,592	9,487	183	1,110	276	17,092
Sheets and strip	25,990	22,386	35,837	6,938	1,002	1,906	956	38,809
Tin and terne plate	.....	.....	.....	.....	16,686	.....	.....	4,272
Structural shapes	348,321	37,840	25,487	119,622	8,234	2,898	10	18,198
Sheet piling	2,186	2,744	.....	266	.....	.....	.....	1,059
Rails and accessories	2,313	2,371	.....	224	.....	.....	.....	1,386
Wheels and axles	.....	.....	.....	.....	.....	.....	.....	629
Pipe and tubing	29,487	137,690	32,262	39,967	52,844	9,639	37,994	34,000
Wire and wire products	224,014	61,028	101,700	46,166	28,239	37,094	2,500	56,453
Totals	1,084,706	521,526	469,096	449,678	135,070	55,328	41,736	273,468

American Iron & Steel Institute.

PIG IRON AND FERROALLOY OUTPUT

(Includes ferroalloys made in electric furnaces, where available)

By countries — net tons

	1959a	1958	1957	1956	1955	1954	1953	1952
World Totals	222,662,000	211,680,237	232,517,746	221,280,822	211,507,562	174,505,389	184,982,794	168,063,937
U. S.	61,000,000	58,808,294	80,798,285	77,575,458	79,263,865	59,806,242	77,250,168	63,353,955
Great Britain	12,852,000	14,520,000	15,998,080	14,750,512	13,966,400	13,309,408	12,515,775	12,015,025
Japan	10,387,000	8,476,700	7,863,800	6,904,800	5,785,280	5,089,130	4,969,910	3,821,620
Canada	4,097,000	3,170,333	3,948,381	3,815,052	3,333,967	2,317,839	3,206,471	2,880,127
India	3,272,000	2,365,500	2,140,700	2,192,500	2,122,176	2,197,440	1,989,455	2,075,360
Australia	2,696,000	2,551,800	2,350,100	2,140,700	2,016,000	2,083,200	1,894,705	1,718,080
South Africa	1,985,000	1,744,200	1,564,200	1,495,800	1,433,824	1,319,360	1,347,360	1,244,320
Austria	1,927,000	2,005,100	2,162,700	1,915,800	1,658,470	1,489,290	1,456,180	1,291,840
Spain	1,854,000	1,478,900	1,101,200	1,040,600	1,094,500	998,580	910,470	870,540
Sweden	1,392,000	1,431,400	1,703,100	1,555,300	1,371,370	1,101,320	1,163,140	1,213,300
Brazil	1,378,000	1,322,800	1,319,500	1,289,700	1,181,400	1,197,790	974,600	892,650
Yugoslavia	970,000	859,900	812,400	713,200	585,400	405,650	309,750	317,460
Norway	641,000	559,900	614,000	498,200	392,420	271,170	305,340	300,930
Mexico	535,000	528,800	456,400	450,800	343,920	261,250	266,760	336,200
Chile	331,000	336,000	421,100	405,600	282,190	336,200	315,280	297,620
Turkey	264,000	254,400	240,300	238,100	221,160	216,050	238,080	217,150
Finland	101,000	111,400	141,100	113,500	125,660	81,570	87,080	119,050
Southern Rhodesia	72,000	70,000	72,000	66,100	22,050	15,430	39,680	42,990
Denmark	57,000	43,900	65,000	61,700	60,630	44,090	39,700	39,700
Argentina	38,000	35,000	37,000	31,300	38,580	43,650	40,010	35,050
Taiwan	26,000	24,000	22,000	19,800	15,400	15,400	7,700	9,920
South Korea	9,000	8,800	8,600	4,400	4,400	2,200	.....	.....
West Germany (b)	19,463,000	18,464,800	20,359,500	19,501,900	18,230,300	13,839,100	12,853,200	14,253,500
France (b)	13,486,000	13,335,200	13,312,500	12,830,800	12,[illegible]	9,835,100	9,434,900	10,745,900
Belgium (b)	6,334,000	6,082,500	6,159,700	6,350,300	5,[illegible]9,000	5,087,500	4,639,800	5,289,000
Luxembourg (b)	3,698,000	3,621,100	3,712,500	3,655,200	3,393,500	3,081,100	2,996,900	3,383,600
Saar (b)	3,544,000	3,410,500	3,492,100	3,341,100	3,164,900	2,746,700	2,620,200	2,895,000
Italy (b)	2,443,000	2,357,600	2,430,600	2,193,000	1,907,400	1,480,600	1,475,100	1,325,500
The Netherlands (b)	1,158,000	1,066,510	772,700	729,700	737,440	671,550	650,100	592,579
Free World Totals	156,010,000	149,070,337	174,077,546	165,885,922	160,871,402	129,323,909	144,221,794	131,468,257
USSR	46,297,000	43,651,100	40,827,000	39,411,600	36,641,000	32,970,000	30,250,000	27,720,000
China	7,000,000	6,500,000	6,060,000	5,265,700	4,048,000	3,385,800	2,443,100	2,583,900
Poland	4,786,000	4,260,400	4,058,700	3,864,700	3,423,310	2,929,080	2,528,900	1,960,200
Czechoslovakia	4,491,000	4,160,100	3,927,500	3,617,700	3,280,200	3,062,400	3,069,000	2,563,000
East Germany	2,037,000	1,956,600	1,833,100	1,735,000	1,668,700	1,450,000	1,174,800	716,100
Hungary	1,189,000	1,212,500	921,500	846,600	940,500	902,000	787,600	632,500
Rumania	794,000	812,200	736,200	642,600	628,450	475,200	501,600	419,980
Bulgaria	58,000	57,000	56,200	11,000	8,000	7,000	6,000	.....
Iron Curtain Totals	66,652,000	62,609,900	58,440,200	55,394,900	50,636,160	45,181,480	40,761,000	36,595,680

(a) Estimated.
(b) Member of European Coal & Steel Community.

U. S. Exports of Iron and Steel Products

(Net tons)

Products	9 Mo. 1959	1958	1957	1956	1955	1954
Semifinished Steel	22,209	124,326	721,166	528,758	721,116	94,938
Shapes and Plates	264,936	554,236	1,075,072	671,559	505,009	443,058
Rails and Accessories	87,721	172,254	245,014	94,511	73,649	121,382
Bars and Tool Steel	53,609	123,098	214,631	296,900	205,393	89,587
Pipe and Tubing	239,267	623,044	1,185,102	782,966	350,155	465,357
Wire and Wire Products	21,782	35,055	39,437	55,265	48,063	43,728
Tin Mill Products	229,966	351,972	620,393	651,436	773,287	671,638
Sheets and Strip	377,097	703,430	1,074,633	1,075,352	1,194,217	729,329
Totals	1,296,587	2,687,415	5,175,448	4,156,747	3,870,889	2,659,017

American Iron & Steel Institute.

U. S. Imports of Iron and Steel Products

(Net tons)

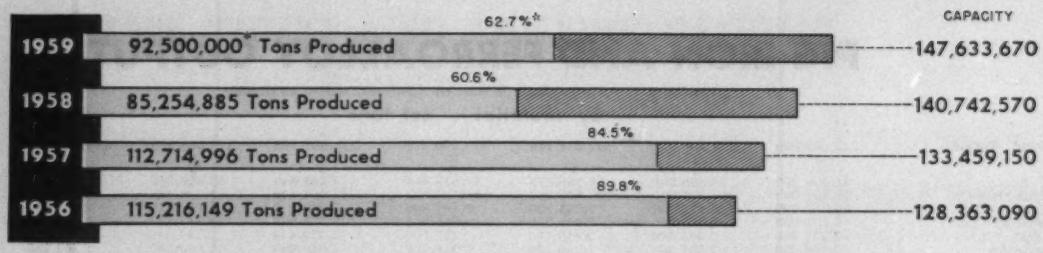
Products	9 Mo. 1959	1958	1957	1956	1955	1954
Semifinished Steel	367,874	199,414	62,432	92,230	193,864	48,625
Shapes and Plates	731,020	266,126	365,497	573,261	202,192	209,906
Rails and Accessories	6,923	4,933	5,417	8,385	7,388	3,871
Bars and Tool Steel	838,932	554,094	188,207	224,440	198,295	213,696
Pipe and Tubing	373,883	200,038	196,836	140,365	77,107	79,589
Wire and Wire Products	557,194	452,850	312,842	257,996	251,841	201,959
Tin Mill Products	20,958	183	123	1,145	47	145
Sheets and Strip	133,824	25,181	27,195	36,516	39,288	25,866
Totals	3,030,608	1,702,819	1,152,549	1,334,338	970,022	783,657

American Iron & Steel Institute.

U.S.A. Production-Capacity

METALWORKING FACTS AND FIGURES

STEEL INGOTS AND STEEL FOR CASTINGS (Net Tons)



ANNUAL STEEL CAPACITY & PRODUCTION BY PROCESSES

	Open Hearth		Bessemer		Crucible		Electric		LD Process	TOTALS		Per Cent
	Capacity	Production	Capacity	Production	Capacity	Production	Capacity	Production	Capacity†	Production		Capacity
1959	126,528,380	.....	3,577,000	.....	40	‡	13,495,090	.....	4,033,160	147,633,670	92,500,000*	62.7*
1958	122,321,830	75,879,394	4,027,000	1,395,985	40	‡	13,312,700	7,979,506	1,081,000	140,742,570	85,254,885	60.6
1957	116,912,410	101,657,776	4,505,000	2,475,138	40	‡	11,501,700	8,582,082	540,000	133,459,150	112,714,996	84.5
1956	112,317,040	102,840,585	4,787,000	3,227,997	40	‡	10,719,010	9,147,567	540,000	128,363,090	115,216,149	89.8
1955	110,234,160	105,359,417	4,787,000	3,319,517	40	‡	10,807,110	8,357,151	.....	125,828,310	117,036,085	93.0
1954	109,094,730	80,327,494	4,787,000	2,548,104	40	‡	10,448,640	5,436,054	.....	124,330,410	88,311,652	71.0
1953	102,677,980	100,473,823	4,637,000	3,855,705	40	‡	10,232,450	7,280,191	.....	117,547,470	111,609,719	94.9
1952	94,973,780	82,846,439	5,381,000	3,523,677	40	‡	8,232,850	6,797,923	.....	108,587,670	93,168,039	85.8
1951	91,054,020	93,166,518	5,621,000	4,890,946	20	‡	7,554,610	7,142,384	.....	104,229,650	105,199,848	100.9
1950	86,984,490	86,262,509	5,537,000	4,534,558	20	‡	6,871,290	6,039,008	.....	99,392,800	96,836,075	96.9#
1949	84,817,040	70,248,803	5,191,000	3,946,656	20	‡	6,112,870	3,782,717	.....	96,120,930	77,978,176	81.1
1948	83,610,690	79,340,157	5,226,000	4,243,172	20	‡	5,396,750	5,057,141	.....	94,233,460	88,640,470	94.1
1947	81,010,990	76,873,793	5,154,000	4,232,543	20	‡	5,076,240	3,787,735	.....	91,241,250	84,894,071	93.0
1946	81,236,250	60,711,963	5,154,000	3,327,737	20	‡	5,500,290	2,563,024	.....	91,890,560	66,602,724	72.5
1945	84,171,590	71,939,602	5,874,000	4,305,318	3,800	24	5,455,890	3,456,704	.....	95,505,280	79,701,648	83.5
1944	82,223,610	80,363,953	6,074,000	5,039,923	3,800	25	5,350,880	4,237,699	.....	93,652,290	89,641,600	95.5#
1943	79,180,880	78,621,804	6,553,000	5,625,492	3,800	146	4,554,980	4,589,070	.....	90,292,660	88,836,512	98.1#
1942	78,107,280	76,501,957	6,721,400	5,553,424	3,800	2,010	3,737,510	3,974,540	.....	88,569,970	86,031,931	96.8#
1941	74,565,510	74,389,619	6,996,520	5,578,071	3,942	2,313	2,586,320	2,869,256	.....	84,152,292	82,839,259	97.3#
1940	73,721,592	61,573,083	6,009,920	3,708,573	5,354	1,024	1,882,630	1,700,006	.....	81,619,496	66,982,686	82.1
1939	72,959,638	48,409,800	7,138,880	3,358,916	5,354	931	1,725,086	1,029,067	.....	81,828,958	52,798,714	64.5

*Estimated by STEEL. †As of Jan. 1. ‡Production included with electric steel. #Based on average annual capacity. American Iron & Steel Institute.

MONTHLY OUTPUT OF STEEL INGOTS & CASTINGS

	Open Hearth		Bessemer		Oxygen Process		Electric		Totals	
	Net Tons	% Capac.	Net Tons	% Capac.	Net Tons	% Capac.	Net Tons	% Capac.	Net Tons	% Capac.
1959	.....	...	.....	...	.....	...	.....	...	92,500,000*	62.7*
10 Mo.	64,899,755	...	1,082,256	...	1,448,948	...	6,733,667	...	74,164,626	...
Jan.	8,280,985	77.1	120,005	39.5	186,820	54.5	729,575	63.7	9,317,385	74.3
Feb.	8,541,031	88.0	128,515	46.8	176,970	57.2	756,422	73.1	9,602,938	84.8
Mar.	10,216,474	95.1	184,892	60.9	236,595	69.1	929,784	81.1	11,567,745	92.3
Apr.	9,884,322	95.0	195,730	66.6	237,018	71.5	964,850	87.0	11,281,920	93.0
May	10,117,968	94.2	200,887	66 1	257,325	75.1	1,024,401	89.4	11,600,581	92.5
June	9,521,053	91.6	185,794	63.2	259,731	78.4	941,056	84.8	10,907,634	89.9
July	4,540,182	42.2	66,433	21.9	94,489	27.6	526,025	45.9	5,227,129	41.7
Aug.	1,171,342	10.9	none	...	none	...	287,935	23.4	1,439,277	11.5
Sept.	1,249,398	12.0	none	...	none	...	285,619	25.8	1,535,017	12.7
Oct.	1,377,000	12.8	none	...	none	...	308,000	26.9	1,685,000	13.4
Nov.	.....	...	.....	...	.....	...	.....	...	.....	...
Dec.	.....	...	.....	...	.....	...	.....	...	.....	...
1958	75,879,394	62.0	1,395,985	34.7	†		7,979,506	55.4	85,254,885	60.6
Jan.	6,085,124	58.6	121,338	35.5	†		547,450	44.8	6,753,912	56.5
Feb.	5,252,112	56.0	81,597	26.4	†		448,614	40.6	5,782,323	53.6
Mar.	5,598,944	53.9	122,317	35.8	†		533,361	43.6	6,254,622	52.3
Apr.	4,875,619	48.5	109,433	33.1	†		547,939	46.3	5,532,991	47.8
May	5,602,123	53.9	110,366	32.3	†		588,670	48.2	6,301,159	52.7
June	6,378,942	63.4	88,125	26.6	†		660,413	55.8	7,127,480	61.6
July	5,712,587	55.0	114,218	33.4	†		615,600	50.4	6,442,405	53.9
Aug.	6,481,185	62.4	134,435	39.3	†		692,383	56.6	7,308,003	61.1
Sept.	6,769,660	67.3	103,194	31.2	†		759,518	64.2	7,632,372	66.0
Oct.	7,795,541	75.0	148,458	43.4	†		895,779	73.3	8,839,778	74.0
Nov.	7,572,555	75.3	145,867	44.1	†		850,896	71.9	8,569,318	74.1
Dec.	7,755,002	74.6	116,637	34.1	†		838,883	68.6	8,710,522	72.9

†Basic oxygen process included in electric for 1958. *Estimated. American Iron & Steel Institute.

PIG IRON †

CAPACITY & PRODUCTION

(Net tons)

	Capacity	Production	%
1959	94,634,850	61,000,000*	64.5*
Jan.	.....	6,260,395	77.9
Feb.	.....	6,192,672	85.3
Mar.	.....	7,510,051	93.4
Apr.	.....	7,392,606	95.0
May	.....	7,747,996	96.4
June	.....	7,289,948	93.7
July	.....	3,573,550	44.5
Aug.	.....	947,779	11.8
Sept.	.....	.....	...
Oct.	.....	.....	...
Nov.	.....	.....	...
Dec.	.....	.....	...
1958	91,000,110	57,764,100	63.5
1957	86,817,950	79,338,932	91.4
1956	85,485,230	75,959,560	88.9
1955	83,971,100	77,789,684	92.6
1954	82,001,390	58,686,884	71.6
1953	79,380,240	75,856,872	95.6
1952	73,782,340	62,150,926	84.2
1951	72,471,780	71,227,750	98.3
1950	71,560,110	65,439,789	91.4
1949	70,541,850	54,175,534	76.8
1948	67,438,930	61,043,806	90.5
1947	65,709,200	59,314,348	90.3
1946	67,340,590	45,547,907	67.6
1945	67,313,890	54,166,482	80.5
1944	67,921,410	62,072,683	91.4

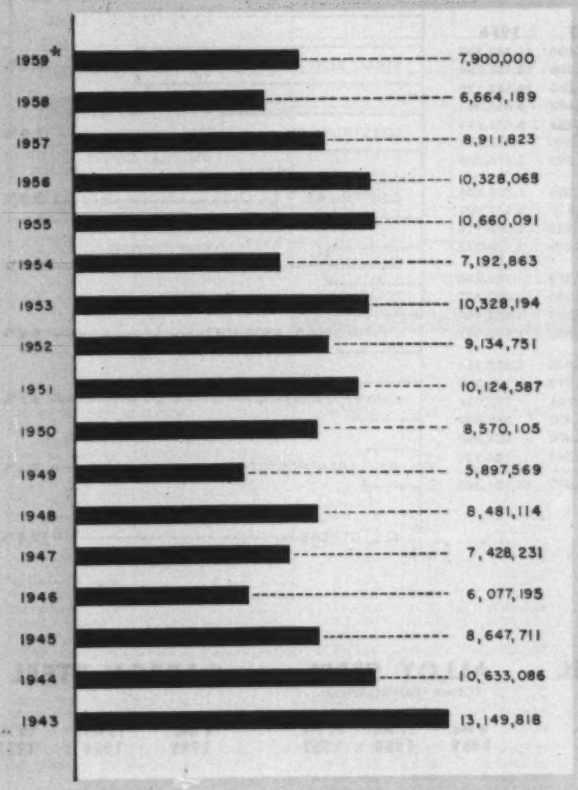
†Including ferroalloys made in blast furnaces. *Estimated by STEEL. American Iron & Steel Institute.

Ferrous Production

METALWORKING FACTS AND FIGURES

ALLOY STEEL PRODUCTION

(Total ingots and castings—net tons)



ALLOY STEEL PRODUCTION BY PROCESSES

(Including stainless steel)
(Ingots and castings—net tons)

	Open Hearth				
	Basic	Acid	Totals	Crucible	Electric
1959‡	.....	.....	3,835,141	†	2,476,858
1958	3,946,160	64,992	4,011,152	†	2,653,037
1957	5,745,682	169,898	5,915,580	†	2,996,243
1956	6,288,648	201,377	6,490,025	†	3,838,043
1955	6,735,450	185,473	6,920,923	†	3,739,168
1954	4,528,336	130,559	4,658,895	†	2,533,968
1953	6,599,033	185,341	6,784,379	†	3,543,815
1952	5,807,191	218,867	6,026,058	†	3,108,693
1951	6,585,635	238,034	6,823,669	†	3,300,918
1950	5,738,067	123,253	5,861,320	†	2,708,785
1949	4,192,344	105,550	4,297,894	†	1,599,675
1948	6,285,054	128,915	6,413,969	†	2,067,145
1947	5,520,540	128,754	5,649,294	†	1,778,937
1946	4,325,657	115,711	4,441,368	†	1,635,827
1945	5,572,353	274,889	5,847,242	18	2,800,451
1944	6,494,627	515,662	7,010,289	23	3,622,774
1943	8,539,523	677,416	9,216,939	136	3,932,743

*Estimated.
‡First seven months.
†Included with electric steel.
American Iron & Steel Institute.

Stainless & Heat Resisting Steel Production

(Net tons of ingots)

Type Number	6 Mo. 1959	12 Mo. 1958	Type Number	6 Mo. 1959	12 Mo. 1958
201	9,714	13,848	403	5,751	13,049
202	8,737	15,660	405	2,528	3,518
301	36,651	39,891	406		
302	94,344	135,337	410	21,752	39,931
302B			414		
303	24,008	26,519	416	17,520	21,850
303Se			416Se		
304	142,761	156,489	420	2,956	3,794
304L	14,463	14,251	430	180,732	211,799
305	4,340	4,755	430F	1,941	1,875
308	2,521	3,409	430F Se		
309	3,519	4,525	431	1,897	2,979
309S	1,082	1,188	440A	866	1,412
310	4,396	6,258	440B	3,070	2,612
310S			440C		
314	....	140	442	874	948
316	28,346	34,534	443		
316L	9,145	13,154	446	1,407	1,529
317	715	634	All other	87,783	69,269
321	18,738	30,715			
347	7,207	17,132	Totals	739,764	892,984
348					

American Iron & Steel Institute.

High Speed and Tool Steels

(Excluding hollow drill steel)
(Shipments—net tons)

	7 Mo. 1959	12 Mo. 1958
HIGH SPEED TOOL STEELS		
Molybdenum Types	11,649	10,020
Tungsten Types	1,531	1,778
Totals	13,180	11,798
HOT-WORK TOOL STEELS		
Chromium Types	7,327	7,991
Tungsten Types	622	615
Miscellaneous Types	708	609
Totals	8,657	9,215
CHROMIUM DIE TOOL STEELS		
High Chromium Types	4,655	4,735
Medium Chromium Types	3,143	3,472
Low Chromium Types	587	245
Totals	8,385	8,452
OIL HARDENING TOOL STEELS		
All Types	10,117	12,575
SHOCK RESISTING TOOL STEELS		
All Types	4,112	4,529
SPECIAL PURPOSE ALLOY TOOL STEELS		
(Including Mold Tool Steels)	8,029	10,529
WATER HARDENING TOOL STEELS		
All Types	12,026	14,325
Grand Totals	64,506	71,423

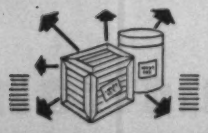
American Iron & Steel Institute.

Steel Forgings

(Shipments for sale—net tons)

	Drop and Upset	Press and Open Hammer	Totals
1959			
Jan.	90,662	22,264	112,926
Feb.	91,487	21,189	112,676
Mar.	104,084	24,732	128,816
Apr.	105,685	29,998	135,683
May	104,579	37,230	141,809
June	108,120	31,902	140,022
July	80,576	22,332	102,908
Aug.	77,484	20,416	97,900
Sept.	79,961	23,429	103,390
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1958	823,857	255,576	1,079,433
Jan.	81,482	26,300	107,782
Feb.	69,895	22,848	92,743
Mar.	69,142	23,138	92,280
Apr.	60,588	21,946	82,534
May	56,656	21,822	78,478
June	65,301	22,485	87,786
July	50,828	16,587	67,415
Aug.	61,374	18,499	79,873
Sept.	70,001	19,396	89,397
Oct.	77,074	22,644	99,718
Nov.	70,011	19,000	89,011
Dec.	91,505	20,911	112,416
1957	1,120,428	376,147	1,496,575
1956	1,256,125	414,182	1,670,307
1955	1,316,540	434,093	1,750,633
1954	1,049,803	351,688	1,401,491

U. S. Bureau of the Census.



Distribution

METALWORKING FACTS AND FIGURES

FINISHED STEEL DISTRIBUTION

By Market Classifications

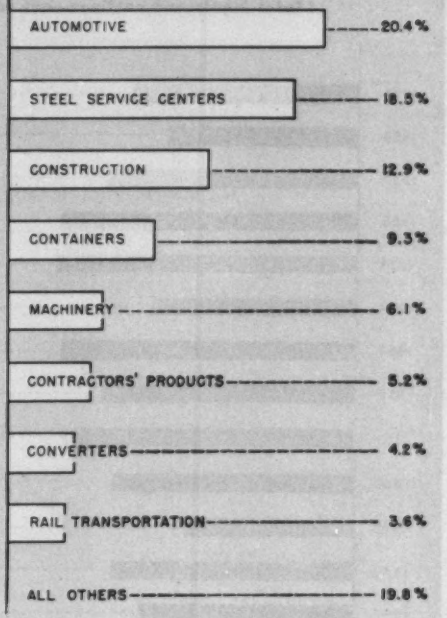
(All grades, net tons)

	1959*	1958	1957	1956
Automotive	14,131,690	10,125,034	14,227,096	14,141,887
Steel Service Centers	12,820,500	10,902,283	14,507,308	16,752,233
Construction, including Maintenance	8,942,440	8,722,549	12,523,285	10,441,126
Containers	6,444,940	6,568,583	6,237,583	6,818,361
Machinery, Indus. Equip. & Tools	4,211,060	3,181,196	4,513,298	5,031,599
Contractors' Products	3,600,560	3,467,189	3,403,580	4,074,577
Converters & Processors	2,892,940	2,854,574	3,396,529	3,776,559
Rail Transportation	2,532,190	1,472,112	4,149,074	4,226,654
Electrical Machinery & Equip.	2,039,625	1,771,514	2,085,675	2,437,804
Other Domestic & Commercial Equip.	1,831,500	1,715,542	1,837,940	2,263,775
Appliances	1,803,750	1,590,095	1,558,569	2,129,115
Unclassified	1,595,625	691,571	820,119	947,180
Export	1,547,060	2,429,149	4,568,795	3,622,427
Agricultural	1,276,500	1,193,114	1,098,102	1,082,459
Bolts, Nuts, Rivets, Screws	1,103,060	878,873	1,149,545	1,485,087
Forgings (except Automotive & Aircraft)	901,875	767,217	1,056,036	1,473,186
Shipbuilding, Marine Equip.	679,875	797,511	1,277,772	760,306
Oil & Gas Drilling	575,810	305,923	700,501	778,714
Mining, Quarrying, Lumbering	242,810	179,505	328,803	349,508
Ordnance, other Military	138,750	238,690	356,406	523,890
Aircraft	62,440	62,209	99,561	134,721
Totals	69,375,000	59,914,433	79,894,377	83,251,168

*Estimated by STEEL.
American Iron & Steel Institute.

WHERE THE STEEL GOES

1959 — ESTIMATED



DISTRIBUTION

NET TONS

By Market Classifications

	STAINLESS STEEL (And heat resisting)			ALLOY STEEL (Other than stainless)			CARBON STEEL		
	6 Mo. 1959	12 Mo. 1958	12 Mo. 1957	6 Mo. 1959	12 Mo. 1958	12 Mo. 1957	6 Mo. 1959	12 Mo. 1958	12 Mo. 1957
Converters & Processors	28,602	55,060	52,442	44,707	52,987	83,477	1,951,111	2,746,547	3,260,610
Forgings (other than Automotive)	5,225	9,670	15,014	229,296	299,027	400,165	399,568	458,520	640,857
Bolts, Nuts, Rivets, Screws	4,057	5,699	8,193	47,827	45,968	73,552	732,491	827,206	1,067,800
Steel Service Centers	152,471	171,556	206,284	356,964	308,533	513,905	8,358,332	10,422,194	13,787,119
Construction, including Maintenance	4,667	8,645	7,762	73,084	98,821	126,296	6,110,860	8,615,083	12,389,227
Contractors' Products	10,875	13,736	14,221	11,758	11,343	17,483	2,466,800	3,442,110	3,371,876
Automotive	63,923	67,640	106,303	1,044,077	1,043,413	1,432,613	8,843,879	9,013,981	12,688,180
Rail Transportation	509	314	1,987	128,630	91,974	221,062	1,645,747	1,379,824	3,926,025
Shipbuilding, Marine Equip.	1,051	2,321	2,342	53,338	93,868	99,590	416,589	701,322	1,175,840
Aircraft	9,908	14,941	25,815	20,545	31,141	46,461	13,087	16,127	27,285
Oil & Gas Drilling	281	591	812	106,760	81,850	167,970	298,007	223,482	531,719
Mining, Quarrying, Lumbering	210	314	522	15,525	16,055	28,985	154,142	163,136	299,296
Agricultural	209	349	621	17,682	24,112	28,192	855,278	1,168,653	1,069,289
Machinery, Indus. Equip. & Tools	31,317	41,978	50,899	379,367	379,005	539,604	2,484,838	2,760,213	3,921,795
Electrical Machinery & Equip.	6,834	9,682	13,391	339,696	394,350	461,128	1,076,318	1,367,482	1,611,156
Appliances, Utensils, Cutlery	28,818	36,924	34,610	10,883	10,709	10,686	1,219,299	1,542,462	1,513,273
Other Domestic & Commercial Equip.	9,075	11,524	14,148	10,793	13,015	18,189	1,257,441	1,691,003	1,805,603
Containers	1,218	1,362	1,739	12,520	13,887	26,255	4,519,896	6,553,334	6,209,589
Ordnance, Other Military	1,472	2,304	2,404	12,674	71,962	76,841	83,388	164,424	277,161
Export	13,014	14,740	26,271	82,649	147,567	217,604	988,075	2,266,842	4,324,920
Unclassified	16,397	24,142	33,975	99,714	114,282	153,155	792,628	553,147	632,989
Totals	390,133	493,492	619,755	3,098,489	3,343,849	4,743,213	44,667,774	56,077,092	74,531,609

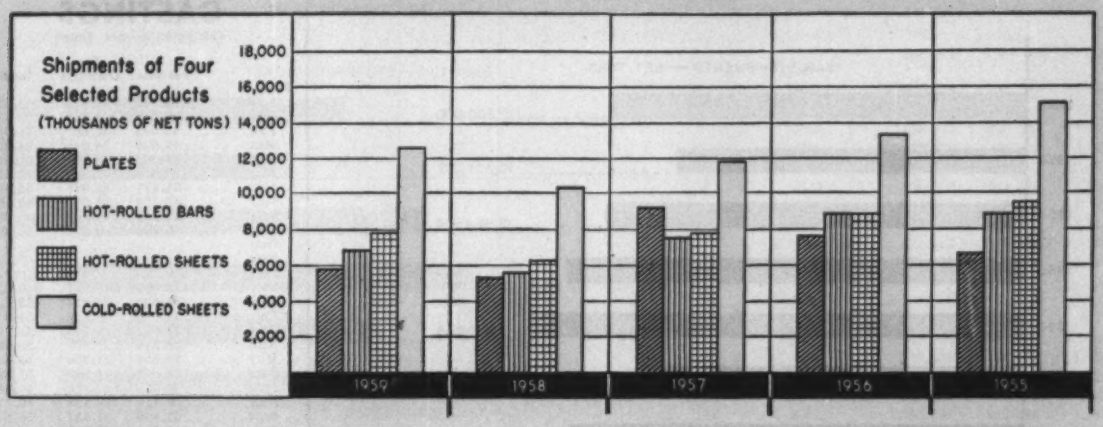
American Iron & Steel Institute.

Steel Shipments

METALWORKING FACTS AND FIGURES

SHIPMENTS OF STEEL PRODUCTS

(All grades, including carbon, alloy, and stainless)



Steel Products—Net tons	Shipments	%	Shipments	%	Shipments	%	Shipments	%	Shipments	%
Ingots & steel castings	242,810	0.35	267,422	0.5	467,456	0.6	702,744	0.9	678,630	0.8
Blooms, slabs, billets, tube rounds, sheet bars, etc.	.....	...	.....	..	.....	..	.....	..	2,744,477	3.2
Blooms, slabs, billets, sheet bars	1,394,435	2.01	1,142,116	1.9	2,307,901	2.9	2,275,640	2.7	.....	..
Tube rounds	13,875	0.02	10,699	..	55,150	0.1	12,530	..	.....	..
Skelp	48,560	0.07	113,546	0.2	152,949	0.2	197,825	0.2	191,591	0.2
Wire rods	1,026,750	1.48	894,936	1.5	961,913	1.2	1,132,434	1.4	1,203,842	1.4
Structural shapes (heavy)	4,238,815	6.11	3,964,608	6.6	6,817,796	8.5	5,348,981	6.4	4,736,987	5.6
Steel piling	367,690	0.53	439,972	0.7	569,673	0.7	434,103	0.5	391,348	0.5
Plates	5,834,435	8.41	5,268,420	8.8	9,248,625	11.6	7,714,623	9.3	6,762,256	8.0
Rails—Standard (over 60 lb)	714,560	1.03	539,320	0.9	1,194,495	1.5	1,201,354	1.4	1,150,977	1.3
Rails—All other	41,625	0.06	39,906	0.1	88,563	0.1	98,362	0.1	82,767	0.1
Joint bars	34,685	0.05	33,894	..	79,942	0.1	81,557	0.1	68,314	0.1
Tie plates	173,440	0.25	105,780	0.2	230,941	0.3	293,201	0.4	311,411	0.4
Track spikes	55,500	0.08	40,460	0.1	73,752	0.1	93,467	0.1	93,097	0.1
Wheels (rolled or forged)	205,125	0.30	155,711	0.3	386,512	0.5	343,396	0.4	306,406	0.4
Axles	90,190	0.13	76,795	0.1	210,760	0.3	171,780	0.2	119,246	0.1
Bars—Hot rolled (including light shapes)	6,888,940	9.93	5,646,563	9.4	7,567,400	9.5	8,840,349	10.6	8,798,281	10.4
Bars—Reinforcing	2,081,250	3.00	2,034,795	3.4	2,300,127	2.9	2,518,891	3.0	2,164,641	2.6
Bars—Cold finished	1,387,500	2.00	1,023,417	1.7	1,319,288	1.6	1,736,369	2.1	1,877,961	2.2
Tool steel	83,250	0.12	70,270	0.1	98,712	0.1	125,866	0.2	114,529	0.1
Standard pipe	2,233,875	3.22	2,174,939	3.6	2,664,489	3.3	2,927,308	3.5	2,968,241	3.5
Oil country goods	2,088,190	3.01	1,158,116	1.9	2,822,854	3.5	2,560,223	3.1	2,542,109	3.0
Line pipe	3,045,565	4.39	2,608,196	4.4	4,218,513	5.3	3,376,063	4.1	3,083,736	3.7
Mechanical tubing	881,060	1.27	561,243	0.9	773,945	1.0	949,846	1.1	965,829	1.1
Pressure tubing	249,750	0.36	245,353	0.4	395,346	0.5	384,988	0.5	276,068	0.3
Wire—Drawn	2,615,435	3.77	2,362,887	3.9	2,598,390	3.2	2,988,377	3.5	3,192,678	3.8
Wire—Nails & staples	374,625	0.54	417,704	0.7	447,301	0.6	537,283	0.7	650,956	0.7
Wire—Barbed & twisted	55,500	0.08	56,031	0.1	59,125	0.1	74,318	0.1	113,372	0.1
Wire—Woven wire fence	152,625	0.22	157,070	0.3	202,652	0.2	273,352	0.3	312,156	0.4
Wire—Bale ties and baling wire	69,375	0.10	57,366	0.1	48,132	0.1	49,672	0.1	60,389	0.1
Black plate	589,690	0.85	621,096	1.0	610,108	0.8	785,055	0.9	797,720	1.0
Tin & terne plate—Hot dipped	423,190	0.61	447,396	0.8	649,974	0.8	950,070	1.1	1,100,782	1.3
Tin plate—Electrolytic	4,974,190	7.17	5,040,190	8.4	4,676,452	5.8	4,615,068	5.6	4,503,637	5.3
Sheets—Hot rolled	7,881,000	11.36	6,291,266	10.5	7,829,992	9.8	8,790,540	10.6	9,430,711	11.1
Sheets—Cold rolled	12,681,750	18.28	10,325,661	17.2	11,879,354	14.9	13,317,002	16.0	15,167,629	17.9
Sheets—Galvanized	2,726,435	3.93	2,828,848	4.7	2,392,637	3.0	2,957,991	3.5	2,864,497	3.4
Sheets—All other coated	249,750	0.36	190,063	0.3	207,853	0.2	226,556	0.3	275,046	0.3
Electrical sheets & strip	582,750	0.84	476,205	0.8	618,883	0.8	813,381	1.0	791,043	0.9
Strip—Hot rolled	1,253,435	1.85	1,048,164	1.8	1,392,460	1.7	1,796,157	2.2	2,089,491	2.5
Strip—Cold rolled	1,290,375	1.86	981,009	1.7	1,274,262	1.6	1,544,646	1.8	1,734,629	2.1
Total steel products	69,375,000	100.00	59,914,433	100.0	79,894,577	100.0	83,251,168	100.0	84,717,444	100.0

1959 Shipments of Finished Steel by Types

(Net tons)

	Carbon	Alloy	Stainless	Totals		Carbon	Alloy	Stainless	Totals
Jan.	5,734,194	401,409	50,565	6,186,168	June	8,986,492	630,215	83,749	9,700,456
Feb.	6,056,969	413,300	54,105	6,524,374	July	3,820,811	276,881	33,575	4,131,267
Mar.	7,534,355	515,408	67,925	8,117,688	Aug.	n.a.	n.a.	n.a.	n.a.
Apr.	7,968,249	560,853	73,424	8,602,526	Sept.	n.a.	n.a.	n.a.	n.a.
May	8,099,208	580,273	74,638	8,754,119	Oct.	n.a.	n.a.	n.a.	n.a.

n.a.—not available because of steel strike.

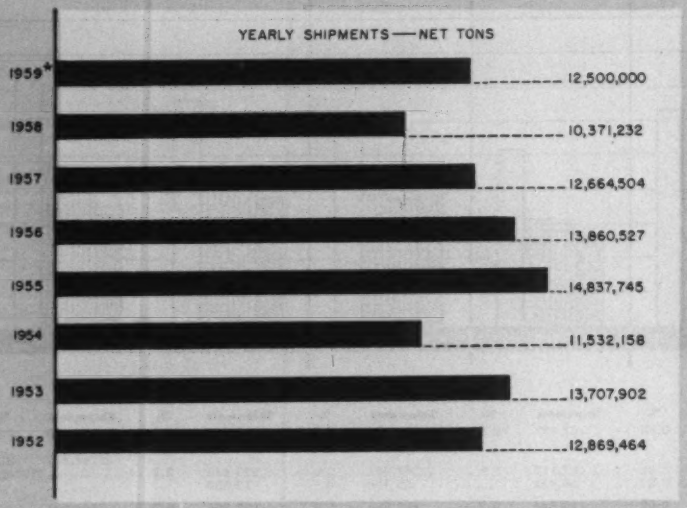
*Estimated.

American Iron & Steel Institute.

Castings

METALWORKING FACTS AND FIGURES

GRAY IRON CASTINGS



(Shipments—net tons)

	Miscellaneous	Ingot Molds	Chilled Iron Railroad Car Wheels	Cast Iron Pressure Pipe & Fittings	Cast Iron Soil Pipe & Fittings	For Sale	For Own Use
1959							
9 Mo.	5,792,622	1,671,009	252,980	1,112,942	685,506	5,380,922	4,134,137
Jan.	625,604	214,990	27,550	75,571	58,056	517,390	484,381
Feb.	642,882	230,706	31,035	75,476	56,556	538,514	498,141
Mar.	701,527	270,293	35,820	108,131	89,801	666,034	539,538
Apr.	726,105	270,476	35,655	129,861	83,605	688,755	556,947
May	706,973	275,563	36,960	141,675	75,979	685,285	550,965
June	707,291	268,479	30,723	160,540	84,983	717,067	534,949
July	602,261	107,604	20,486	133,175	79,960	532,976	410,510
Aug.	485,444	13,482	18,479	145,853	80,306	506,756	236,808
Sept.	595,435	19,416	16,272	142,660	76,260	528,145	321,898
Oct.	.....	.....	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....	.....	.....
1958	6,155,378	1,884,396	265,114	1,277,685	788,659	5,863,154	4,508,078
Jan.	580,545	135,110	23,511	78,863	50,226	436,398	431,857
Feb.	503,175	116,168	25,959	67,606	40,398	389,708	363,598
Mar.	499,751	125,887	24,777	87,716	57,437	446,822	348,746
Apr.	483,999	121,489	25,401	112,292	63,539	457,498	349,222
May	469,026	134,312	23,498	123,017	70,201	472,192	347,862
June	503,252	135,477	22,928	129,671	76,620	541,904	326,044
July	430,883	157,478	19,928	110,790	72,481	465,650	325,910
Aug.	410,876	165,006	18,537	129,157	78,897	513,862	288,611
Sept.	518,185	175,323	20,783	125,693	76,720	537,717	378,987
Oct.	551,380	207,500	22,970	129,375	81,505	586,614	406,116
Nov.	575,586	201,704	18,801	98,326	63,889	505,290	453,016
Dec.	628,720	208,942	18,021	85,179	56,746	509,499	488,109
1957	7,786,229	2,409,290	359,332	1,351,345	758,308	6,876,497	5,788,007
Jan.	761,697	261,964	31,139	101,089	57,346	642,317	570,898
Feb.	705,585	230,126	30,079	89,146	48,182	582,010	521,108
Mar.	713,767	214,775	36,995	108,158	59,451	604,481	528,655
Apr.	699,395	192,199	36,979	128,710	63,066	611,443	508,906
May	674,460	192,336	34,406	141,655	69,209	625,496	486,600
June	630,513	193,640	32,087	131,360	70,864	599,494	458,970
July	565,897	190,434	31,209	106,532	60,030	523,489	430,613
Aug.	630,130	205,655	28,976	138,209	72,987	596,779	479,178
Sept.	579,444	202,914	23,681	119,659	64,411	563,477	426,662
Oct.	665,895	210,521	26,306	122,149	71,653	601,109	498,415
Nov.	599,292	166,652	24,302	91,138	58,754	482,732	457,606
Dec.	557,154	148,074	23,173	73,500	62,325	443,670	420,554
1956	8,265,526	2,624,146	406,191	1,746,902	817,762	7,960,391	5,900,136
1955	9,156,253	2,739,874	385,041	1,687,062	869,515	7,966,735	6,871,010
1954	7,291,912	1,784,625	336,239	1,375,671	743,711	6,322,989	5,209,169
1953	8,449,837	2,828,159	467,142	1,285,598	677,166	7,494,843	6,213,059
1952	8,122,274	2,238,309	544,896	1,312,518	651,467	7,371,700	5,497,764

*Estimated.
U. S. Bureau of the Census.

MALLEABLE IRON CASTINGS

(Shipments—net tons)

	For Sale	For Own Use	Totals
1959			
9 Mo.	420,526	282,007	702,533
Jan.	43,667	29,519	73,186
Feb.	42,093	32,667	74,760
Mar.	49,690	34,645	84,335
Apr.	54,306	36,668	90,974
May	49,619	33,853	83,472
June	51,411	34,086	85,497
July	43,128	26,056	69,184
Aug.	40,143	24,919	65,062
Sept.	46,469	29,594	76,063
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1958	383,839	276,811	660,650
Jan.	34,920	27,814	62,734
Feb.	31,006	23,644	54,650
Mar.	29,624	22,084	51,708
Apr.	29,388	21,307	50,695
May	26,656	21,650	48,306
June	31,077	20,805	51,882
July	24,479	17,386	41,865
Aug.	29,414	19,838	49,252
Sept.	31,999	24,837	56,836
Oct.	40,014	20,967	60,981
Nov.	35,221	28,135	63,356
Dec.	40,041	28,344	68,385
1957	520,118	342,858	862,976
Jan.	51,508	34,469	85,977
Feb.	46,729	31,299	78,028
Mar.	48,311	29,702	78,013
Apr.	51,320	28,951	80,271
May	46,277	30,227	76,504
June	44,639	27,917	72,556
July	34,876	22,872	57,748
Aug.	39,644	25,782	65,426
Sept.	38,397	24,060	62,457
Oct.	45,989	31,678	77,667
Nov.	38,085	29,819	67,904
Dec.	34,343	26,082	60,425
1956	557,636	394,232	951,868
1955	652,552	452,223	1,104,775
1954	461,925	360,091	822,016
1953	578,749	391,757	970,506
1952	573,472	352,648	926,120
1951	656,076	429,165	1,085,241

Standard Malleable

(Shipments—net tons)

	For Sale	For Own Use	Totals
1959			
9 Mo.	339,986	217,793	557,779
Jan.	35,139	21,561	56,700
Feb.	31,976	25,597	57,573
Mar.	40,515	26,924	67,439
Apr.	43,835	28,748	72,583
May	40,438	26,074	66,512
June	42,453	25,973	68,426
July	35,787	19,333	55,120
Aug.	33,224	19,993	53,217
Sept.	36,619	23,590	60,209
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1958	313,597	227,003	540,600
1957	431,662	281,877	713,539
1956	479,563	333,342	812,905

Pearlitic Malleable

(Shipments—net tons)

	For Sale	For Own Use	Totals
1959			
9 Mo.	80,540	64,214	144,754
Jan.	8,528	7,958	16,486
Feb.	10,117	7,070	17,187
Mar.	9,175	7,721	16,896
Apr.	10,471	7,920	18,391
May	9,181	7,779	16,960
June	8,958	8,113	17,071
July	7,341	6,723	14,064
Aug.	6,919	4,926	11,845
Sept.	9,850	6,004	15,854
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1958	70,242	49,808	120,050
1957	88,456	60,981	149,437
1956	78,073	60,890	138,963

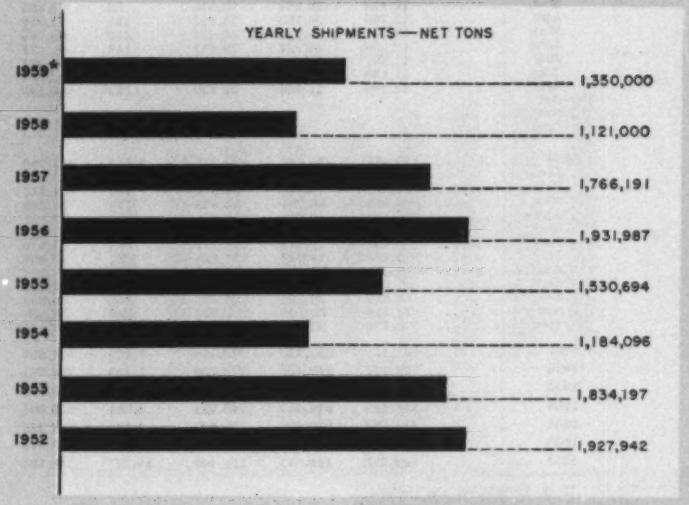
U. S. Bureau of the Census.

Castings

METALWORKING FACTS AND FIGURES

STEEL CASTINGS

(Shipments—net tons)



	Carbon	Alloy, Including Stainless	For Sale	For Own Use	Totals
1959					
9 Mo.	786,774	278,077	837,655	227,196	1,064,851
Jan.	76,242	29,150	82,683	22,709	105,392
Feb.	79,635	30,645	86,013	24,267	110,280
Mar.	96,309	35,008	103,848	27,469	131,317
Apr.	99,295	35,049	104,890	29,454	134,344
May	101,504	33,855	105,804	29,555	135,359
June	107,000	36,624	111,725	31,899	143,624
July	78,316	28,474	83,541	23,249	106,790
Aug.	74,825	23,189	79,188	18,826	98,014
Sept.	73,648	26,083	79,963	19,768	99,731
Oct.	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....
1958	801,846	319,154	856,986	264,014	1,121,000
Jan.	87,525	33,197	94,717	26,005	120,722
Feb.	74,283	29,014	79,706	23,589	103,297
Mar.	77,564	28,669	82,195	24,038	106,233
Apr.	65,639	25,825	69,121	22,343	91,464
May	61,105	25,897	66,086	20,916	87,002
June	67,227	25,634	71,624	21,237	92,861
July	46,858	21,944	48,618	20,184	68,802
Aug.	57,539	23,347	59,816	21,070	80,886
Sept.	60,392	24,885	64,588	20,691	85,277
Oct.	67,906	27,483	73,347	22,022	95,369
Nov.	59,793	25,474	65,788	19,479	85,267
Dec.	76,015	27,785	81,360	22,440	103,800
1957	1,328,478	437,713	1,359,747	406,444	1,766,191
Jan.	125,389	43,851	133,826	35,414	169,240
Feb.	114,805	40,127	121,667	33,265	154,932
Mar.	121,089	38,965	124,416	35,638	160,054
Apr.	122,894	39,604	124,549	37,949	162,498
May	124,849	39,735	125,431	39,144	164,575
June	116,759	36,888	119,353	34,294	153,647
July	91,730	30,288	90,037	31,981	122,018
Aug.	113,167	32,759	111,080	34,846	145,926
Sept.	106,261	32,741	105,611	33,391	139,002
Oct.	110,100	36,297	113,216	33,181	146,397
Nov.	93,343	33,772	98,436	28,679	127,115
Dec.	88,101	32,686	92,125	28,662	120,787
1956	1,444,765	487,219	1,512,290	419,697	1,931,987
1955	1,088,489	442,205	1,166,706	363,988	1,530,694
1954	802,811	381,285	878,360	305,736	1,184,096
1953	1,276,729	557,468	1,400,013	434,184	1,834,197
1952	1,375,233	552,709	1,476,242	451,700	1,927,942

U. S. Bureau of the Census.

Iron and Steel Castings

(Shipments, all types—net tons)

	For Sale	For Own Use	Totals
1959			
9 Mo.	6,639,103	4,643,340	11,282,443
Jan.	643,740	536,609	1,180,349
Feb.	666,620	555,075	1,221,695
Mar.	819,572	601,652	1,421,224
Apr.	847,951	623,069	1,471,020
May	840,708	614,373	1,455,081
June	880,203	600,934	1,481,137
July	659,645	459,815	1,119,460
Aug.	626,087	280,553	906,640
Sept.	654,577	371,260	1,025,837
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1958	7,103,979	5,048,903	12,152,882
Jan.	566,035	485,676	1,051,711
Feb.	500,422	410,831	911,253
Mar.	558,641	394,868	953,509
Apr.	556,007	392,872	948,879
May	564,934	390,428	955,362
June	644,605	368,086	1,012,691
July	538,747	363,480	902,227
Aug.	603,092	329,519	932,611
Sept.	634,302	424,515	1,058,817
Oct.	699,995	449,105	1,149,100
Nov.	606,299	500,630	1,106,929
Dec.	630,900	538,893	1,169,793
1957	8,756,362	6,537,309	15,293,671
1956	10,030,317	6,714,065	16,744,382
1955	9,785,993	7,687,221	17,473,214
1954	7,663,274	5,874,996	13,538,270
1953	9,473,605	7,039,000	16,512,605
1952	9,421,414	6,302,112	15,723,526

U. S. Bureau of the Census.

High Alloy Castings

(Total U. S. production—tons)

	Heat Resistant	Corrosion Resistant	Abrasion Resistant	Totals‡
1959	14,991*	15,472*	3,225*	33,689*
1st Qtr	3,261†	3,469†	720†	7,450†
2nd Qtr	4,126†	4,050†	880†	9,056†
3rd Qtr	3,505†	3,704†	775†	7,984†
4th Qtr	4,100*	4,250*	850*	9,200*
1958	10,930	13,922	2,151	27,003
1st Qtr	2,973	3,838	590	7,400
2nd Qtr	2,788	3,658	559	7,005
3rd Qtr	2,461	2,986	471	5,918
4th Qtr	2,709	3,440	531	6,680
1957	15,798	17,968	4,064	37,832
1956	18,994	18,353	5,277	42,624
1955	15,250	12,871	5,107	33,228
1954	14,554	12,158	4,213	30,926
1953	19,656	14,576	4,353	38,585
1952	20,404	13,099	3,914	37,416
1951	19,139	14,386	3,066	36,590
1950	13,447	9,517	1,661	24,624
1949	9,896	6,499	750	17,145
1948	12,015	8,143	1,263	21,420
1947	10,753	8,173	767	19,693
1946	10,199	7,575	930	18,705

‡Totals may not be precise because of rounded data.
*Estimated. †Preliminary.
Alloy Casting Institute.

NONFERROUS CASTINGS

Zinc and Zinc-Base Alloy Castings

(Shipments—thousands of pounds)

	Die	All Other	Totals
1959			
9 Mo.	484,974	5,008	489,982
Jan.	54,930	509	55,439
Feb.	50,784	584	51,368
Mar.	57,066	534	57,600
Apr.	56,855	470	57,325
May	59,983	673	60,656
June	55,608	520	56,128
July	46,263	493	46,756
Aug.	46,084	482	46,566
Sept.	57,401	743	58,144
Oct.	.....	....	.....
Nov.	.....	....	.....
Dec.	.....	....	.....
1958	584,609	5,462	590,071
Jan.	58,235	446	58,681
Feb.	49,099	444	49,543
Mar.	45,607	508	46,115
Apr.	41,097	461	41,558
May	41,868	448	42,316
June	43,801	466	44,267
July	37,687	372	38,059
Aug.	41,230	430	41,660
Sept.	54,238	484	54,722
Oct.	51,879	458	52,337
Nov.	55,766	473	56,239
Dec.	64,102	472	64,574
1957	664,439	5,336	669,775
1956	687,421	6,896	694,317
1955	769,480	8,520	778,000
1954	513,902	6,556	520,458

U. S. Bureau of the Census.

Magnesium and Magnesium-Base Alloy Castings

(Shipments—thousands of pounds)

	1959	1958	1957	1956	1955
Jan.	2,291	2,018	3,207	2,959	2,307
Feb.	2,249	1,873	2,661	2,977	2,158
Mar.	2,129	2,089	2,970	3,046	2,576
Apr.	2,455	2,332	2,896	3,140	2,621
May	2,370	2,538	2,832	3,021	2,397
June	2,484	2,335	2,973	2,949	2,366
July	2,265	2,366	2,544	2,810	1,913
Aug.	2,243	1,941	2,315	3,059	2,172
Sept.	2,263	2,977	2,279	3,079	2,468
Oct.	....	2,747	2,192	3,442	2,299
Nov.	....	2,754	1,920	2,892	2,324
Dec.	....	2,806	1,533	2,794	2,253
Totals	....	28,776	30,322	36,168	27,854

YEARLY SHIPMENTS

1954	25,777	1952	34,857
1953	34,517	1951	30,825

U. S. Bureau of the Census.

Lead and Lead-Base Alloy Die Castings

(Shipments—thousands of pounds)

	1959	1958	1957	1956	1955
Jan.	1,599	1,591	1,883	1,598	1,742
Feb.	1,315	1,309	1,435	1,636	1,577
Mar.	1,765	1,651	1,865	1,644	1,541
Apr.	1,662	1,486	2,070	1,910	1,618
May	2,025	1,689	2,373	1,919	1,536
June	2,007	2,015	2,336	1,833	2,052
July	1,858	1,437	2,079	1,551	1,689
Aug.	1,898	1,840	2,165	2,112	1,911
Sept.	2,218	1,761	2,115	1,539	1,931
Oct.	....	1,737	2,481	2,206	1,795
Nov.	....	1,428	1,590	1,788	1,903
Dec.	....	1,512	1,399	1,483	1,822
Totals	....	19,456	23,791	21,219	21,117

YEARLY TOTALS

1954	18,396	1952	20,941
1953	20,444	1951	25,936

U. S. Bureau of the Census.

Aluminum and Aluminum-Base Alloy Castings

(Shipments—thousands of pounds)

	Sand	Permanent Mold	Die	Other	Totals
1959					
9 Mo.	106,457	213,339	276,713	842	597,351
Jan.	11,238	24,844	32,813	1	68,896
Feb.	10,802	25,428	32,147	4	68,381
Mar.	12,412	26,964	33,949	26	73,351
Apr.	12,700	26,153	33,992	131	72,976
May	11,979	25,283	30,877	129	68,268
June	12,306	24,927	29,092	146	66,471
July	11,581	20,410	24,786	134	56,911
Aug.	11,130	17,824	26,818	132	55,904
Sept.	12,309	21,506	32,239	139	66,193
Oct.	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....
1958	125,487	224,092	290,275	1,846	641,700
Jan.	11,475	21,792	28,689	225	62,181
Feb.	10,239	18,602	25,376	130	54,347
Mar.	9,929	18,387	25,833	139	54,288
Apr.	10,133	16,085	22,026	203	48,447
May	9,921	16,406	21,123	93	47,543
June	9,159	16,479	18,122	190	43,950
July	9,233	14,943	17,628	231	42,035
Aug.	9,684	17,477	21,225	152	48,538
Sept.	11,007	19,687	25,954	88	56,716
Oct.	11,643	20,796	27,032	148	59,639
Nov.	11,318	20,506	27,904	106	59,836
Dec.	11,726	22,948	29,363	141	64,178
1957	144,121	232,326	373,586	1,623	751,656
1956	171,781	245,421	376,230	1,149	794,581
1955	165,482	295,349	355,203	1,746	820,780
1954	156,555	214,407	245,291	6,801	623,054
1953	214,553	200,025	239,330	4,114	658,022
1952	194,616	146,883	169,732	7,748	518,979
1951	193,378	160,011	151,465	10,277	515,131

U. S. Bureau of the Census.

Copper and Copper-Base Alloy Castings

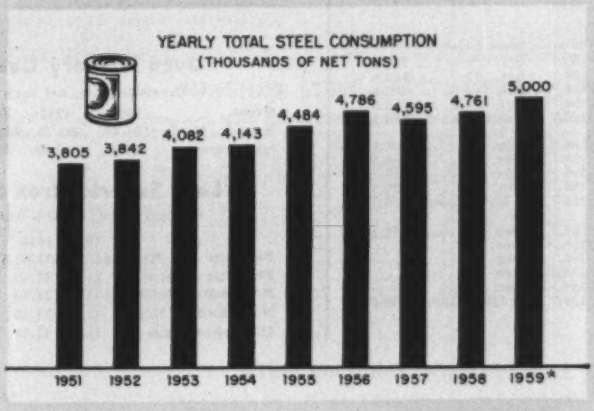
(Shipments—thousands of pounds)

	Sand	Permanent Mold	Die	Other	Totals
1959					
9 Mo.	598,563	38,676	10,729	28,589	676,557
Jan.	62,266	3,753	1,260	2,844	70,123
Feb.	64,558	4,077	1,237	2,882	72,754
Mar.	69,472	4,333	1,361	3,475	78,641
Apr.	73,567	4,640	1,328	3,264	82,799
May	69,351	4,363	1,291	3,408	78,413
June	70,836	4,421	1,175	3,298	79,730
July	61,650	3,869	948	2,608	69,073
Aug.	60,346	4,410	993	3,230	68,979
Sept.	66,517	4,810	1,138	3,580	76,045
Oct.	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....
1958	697,360	31,854	10,148	23,122	762,484
Jan.	65,714	2,911	876	2,250	71,751
Feb.	54,650	2,501	774	1,818	60,073
Mar.	56,207	2,979	811	1,987	61,984
Apr.	55,399	2,967	948	1,737	61,051
May	53,666	2,696	894	1,877	59,133
June	54,041	2,634	844	1,317	58,836
July	48,396	2,028	765	1,360	52,549
Aug.	54,992	2,113	688	1,761	59,554
Sept.	60,821	2,522	865	2,335	66,543
Oct.	70,254	2,824	796	2,512	76,386
Nov.	59,690	2,274	803	1,979	64,746
Dec.	63,500	3,105	1,084	2,189	69,878
1957	789,014	44,789	10,776	30,048	874,627
1956	866,545	57,522	10,075	32,164	966,306
1955	905,867	63,111	8,512	31,408	1,008,898
1954	751,917	48,848	6,509	27,394	834,668
1953	888,369	61,316	10,077	30,734	990,496
1952	910,862	63,865	8,259	26,924	1,009,910
1951	1,075,437	69,833	12,516	39,607	1,197,443

U. S. Bureau of the Census.

METAL CANS

(Shipments in terms of net tons of steel consumed)



1959	Food Cans	Nonfood Cans	Totals	For Sale
9 Mo.	2,364,272	1,588,237	3,952,509	3,441,604
Jan.	179,875	134,286	314,161	262,953
Feb.	174,170	129,612	303,782	256,424
Mar.	185,424	155,437	340,861	287,082
Apr.	218,563	170,882	389,445	329,507
May	219,130	181,311	400,441	346,376
June	251,364	193,347	444,711	385,472
July	301,612	200,864	502,476	450,667
Aug.	422,521	192,252	614,773	546,123
Sept.	411,613	230,246	641,859	577,000
Oct.	.....	.....	.....	.....
Nov.	.....	.....	.....	.....
Dec.	.....	.....	.....	.....
1958	2,911,521	1,849,183	4,760,704	4,091,266
Jan.	191,319	132,820	324,139	270,552
Feb.	182,205	124,145	306,350	260,315
Mar.	214,189	139,421	353,610	306,317
Apr.	178,880	142,042	320,902	263,880
May	198,463	167,432	365,895	307,083
June	222,535	186,243	408,778	352,469
July	288,590	189,210	477,800	417,980
Aug.	418,405	174,753	593,158	524,133
Sept.	392,306	164,100	556,406	480,502
Oct.	287,594	161,663	449,257	390,800
Nov.	183,969	131,790	315,759	272,808
Dec.	153,086	135,564	288,650	244,427
1957	2,816,293	1,778,675	4,594,968	3,962,109
Jan.	182,546	131,149	313,695	262,952
Feb.	160,674	118,736	279,410	234,193
Mar.	177,923	144,878	322,801	267,700
Apr.	334,928	170,859	505,787	446,336
May	175,292	162,728	338,021	280,920
June	203,983	156,573	360,556	308,196
July	270,136	181,938	452,074	404,235
Aug.	368,261	177,120	545,381	488,185
Sept.	346,181	148,953	495,134	430,362
Oct.	259,694	146,120	405,814	348,333
Nov.	168,749	116,025	284,774	242,053
Dec.	167,925	123,596	291,521	248,644
1956	3,011,980	1,773,691	4,785,671	4,113,401
1955	2,801,601	1,682,398	4,483,999	3,909,855
1954	2,605,124	1,538,205	4,143,329	3,657,604
1953	2,614,764	1,467,490	4,082,254	3,571,489
1952	2,554,874	1,287,296	3,842,170	3,340,899
1951	2,558,591	1,245,960	3,804,551	3,309,592

U. S. Bureau of the Census.

*Estimated.

Metal Closures for Glass Containers

(Shipments in thousands of units)

1959	Commercial Closures	Home Canning Closures
9 Mo.	11,840,173	11,687,572
January	1,127,939	705,543
February	1,178,185	788,831
March	1,225,982	1,016,150
April	1,314,551	1,236,570
May	1,333,761	1,530,561
June	1,506,171	1,806,976
July	1,527,228	1,763,512
August	1,331,051	1,893,241
September	1,295,305	945,888
October	.....	.....
November	.....	.....
December	.....	.....
1958	14,653,099	14,381,865
January	1,230,531	524,369
February	1,238,862	544,437
March	1,591,975	681,667
April	1,091,300	918,982
May	1,097,456	1,832,695
June	1,220,711	2,222,335
July	1,094,954	1,884,565
August	1,259,252	2,506,483
September	1,349,867	1,808,177
October	1,329,623	541,895
November	1,047,906	425,192
December	1,100,662	491,068
1957	13,742,356	12,932,527
1956	14,217,467	14,306,032
1955	14,135,632	14,227,332

U. S. Bureau of the Census.

Crowns

(Shipments in gross)

	1959	1958	1957
Jan.	23,577,362	29,518,438	20,854,903
Feb.	20,503,309	48,070,949	21,131,074
Mar.	25,398,214	14,867,451	26,313,951
Apr.	26,797,954	16,829,012	27,724,112
May	29,602,438	21,824,210	32,325,995
June	35,315,183	27,601,464	31,263,410
July	32,305,097	27,676,378	33,611,886
Aug.	29,315,634	26,591,418	30,317,394
Sept.	28,263,447	24,089,091	25,582,392
Oct.	.....	23,944,794	23,970,416
Nov.	.....	25,503,020	18,193,501
Dec.	.....	20,249,040	22,483,036
Totals	.....	306,765,265	313,772,070

YEARLY TOTALS

1956.... 310,202,831 1955.... 326,733,012

U. S. Bureau of the Census.

Steel Barrels, Drums, and Pails

(Shipments in thousands of units)

1959	Heavy Type	Light Type	Grease Drums	Pails
9 Mo.	16,273	7,724	2,169	63,052
Jan.	1,560	802	243	5,008
Feb.	1,571	752	238	5,449
Mar.	1,770	876	247	6,639
Apr.	1,881	915	276	7,724
May	2,199	942	324	8,214
June	2,572	994	275	9,163
July	1,781	837	245	7,294
Aug.	1,507	798	178	6,734
Sept.	1,432	808	143	6,827
Oct.	....	....	....	....
Nov.	....	....	....	....
Dec.	....	....	....	....
1958	19,018	9,315	3,158	72,179
Jan.	1,611	755	221	5,398
Feb.	1,470	629	208	4,595
Mar.	1,551	722	245	5,414
Apr.	1,549	767	258	6,100
May	1,662	794	262	6,862
June	1,594	789	282	6,755
July	1,542	806	302	6,683
Aug.	1,580	810	258	6,419
Sept.	1,829	856	306	7,655
Oct.	1,602	871	304	6,227
Nov.	1,412	747	246	4,972
Dec.	1,616	769	268	5,099
1957	21,970	10,583	3,148	73,678
1956	23,012	11,768	3,210	82,097
1955	22,044	11,507	3,384	77,708

U. S. Bureau of the Census.

Prices

METALWORKING FACTS AND FIGURES

1959 WEEKLY INDEX OF FINISHED STEEL PRICES

(U. S. Bureau of Labor Statistics—1947-49=100)

Week Ended	Index	Week Ended	Index	Week Ended	Index	Week Ended	Index
Jan. 6	186.9	Apr. 7	186.7	July 7	186.7	Oct. 6	186.8
Jan. 13	187.0	Apr. 14	186.7	July 14	186.7	Oct. 13	186.8
Jan. 20	187.0	Apr. 21	186.7	July 21	186.7	Oct. 20	186.8
Jan. 27	187.0	Apr. 28	186.7	July 28	186.7	Oct. 27	186.8
Jan. Index	187.0	Apr. Index	186.7	July Index	186.7	Oct. Index	186.8
Feb. 3	187.0	May 5	186.7	Aug. 4	186.7	Nov. 3	186.8
Feb. 10	187.0	May 12	186.7	Aug. 11	186.7	Nov. 10	186.8
Feb. 17	187.0	May 19	186.7	Aug. 18	186.7	Nov. 17	186.8
Feb. 24	186.9	May 26	186.7	Aug. 25	186.7	Nov. 24	186.8
Feb. Index	187.0	May Index	186.7	Aug. Index	186.7	Nov. Index	186.8
Mar. 3	186.8	June 2	186.7	Sept. 1	186.7	Dec. 1	186.8
Mar. 10	186.7	June 9	186.7	Sept. 8	186.7	Dec. 8	....
Mar. 17	186.7	June 16	186.7	Sept. 15	186.7	Dec. 15	....
Mar. 24	186.7	June 23	186.7	Sept. 22	186.8	Dec. 22	....
Mar. 31	186.7	June 30	186.7	Sept. 29	186.8	Dec. 29	....
Mar. Index	186.7	June Index	186.7	Sept. Index	186.7	†Dec. Index	186.8

†Preliminary.

Beehive Metallurgical Coke

(Average price, net ton)

	1959	1958	1957	1956
Connellsville, furnace	$15.01	$15.25	$15.22	$14.35
Connellsville, foundry	18.25	18.25	18.12	16.97

Oven Foundry Coke

(Average price, net ton)

Ovens	1959	1958	1957	1956
Kearny, N. J.	$31.19	$29.75	$29.77	$27.55
Milwaukee	31.94	30.50	30.50	28.33

Lake Superior Iron Ore

(Per gross ton; 51.50% iron)

	1959	1958	1957	1956
Bessemer Old Range	$11.85	$11.85	$11.85	$11.25
Bessemer Mesabi	11.60	11.60	11.60	11.00
Nonbessemer Old Range	11.70	11.70	11.70	11.10
Nonbessemer Mesabi	11.45	11.45	11.45	10.85
High phosphorus	11.45	11.45	11.45	10.85

FINISHED STEEL—WEIGHTED PRICE COMPOSITE

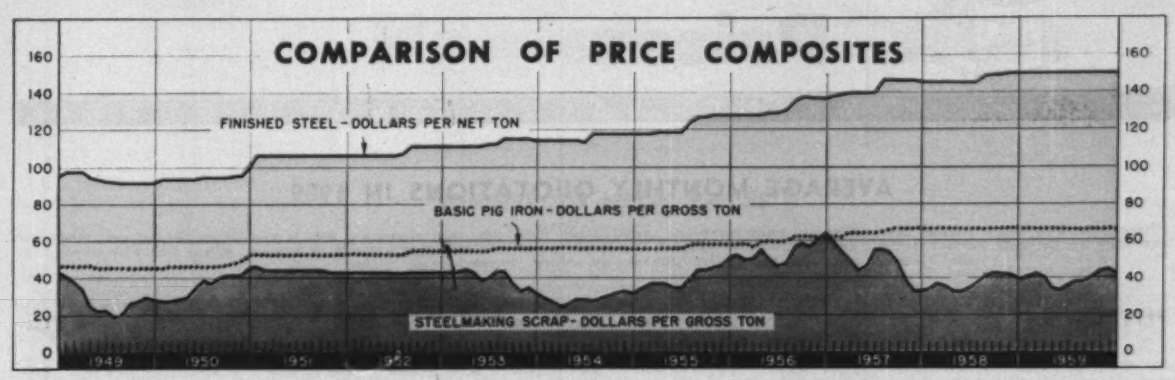
(Based on average shipments and prices during five-year base period, 1935-39: Structural shapes, plates, rails, hot rolled and cold finished bars, pipe, wire, nails, tin plate, hot and cold rolled sheets, galvanized sheets, hot and cold rolled strip)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
1959..	247.82	247.82	247.82	247.82	247.82	247.82	247.82	247.82	247.82	247.82	247.82	247.82	247.82
1958..	239.15	239.15	239.15	239.15	239.15	239.15	239.15	246.33	246.65	246.65	247.82	247.82	242.44
1957..	225.92	226.81	227.41	227.41	228.59	228.59	237.04	239.15	239.15	239.15	239.15	239.15	233.13
1956..	209.10	209.10	209.10	209.10	210.45	210.45	210.45	221.90	225.71	225.58	225.92	225.92	216.06
1955..	194.53	194.53	194.53	194.53	194.53	194.53	207.59	207.56	207.56	208.90	208.90	208.90	201.38
1954..	189.74	189.74	189.74	189.74	189.74	189.75	194.19	194.19	194.19	194.53	194.53	194.53	192.05
1953..	181.31	181.31	181.31	181.31	182.24	186.06	189.35	189.38	189.80	189.91	189.91	189.74	185.97
1952..	171.92	171.92	171.92	171.92	171.92	171.92	173.83	181.31	181.31	181.31	181.31	181.31	175.99
1951..	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92
1950..	156.13	156.13	156.13	156.13	156.13	156.54	156.69	156.95	156.99	157.53	157.76	167.57	157.57
1949..	155.05	155.05	154.85	154.01	152.90	152.90	152.80	152.52	152.52	152.52	152.52	154.75	153.53
1948..	132.93	134.56	135.91	135.91	135.02	134.56	143.08	151.99	151.86	151.86	151.86	151.86	142.62
1947..	117.90	118.67	118.67	118.67	118.67	118.67	120.39	128.96	128.96	128.96	129.28	129.28	123.09
1946..	101.87	106.82	111.62	111.62	111.62	111.86	112.04	112.04	112.04	112.04	112.04	112.82	110.70
1945..	100.32	100.65	100.65	100.65	101.10	101.78	101.78	101.85	101.87	101.87	101.87	101.87	101.36
1944..	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16
1943..	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16

FINISHED STEEL—ANNUAL PRICE AVERAGES

(Per net ton, Pittsburgh)

	SHEETS			STRIP		Tin	BARS					Basic	Standard
	H.R.	C.R.	Galv.	H.R.	C.R.	Plate	H.R.	C.F.	Plates	Shapes		Wire	Nails
1959	$102.00	$105.50	$137.50	$102.00	$148.50	$213.00	$113.50	$153.00	$106.00	$110.00		$160.00	$179.00
1958	99.96	122.88	134.29	99.96	145.29	207.17	110.58	148.92	103.60	107.30		155.92	179.00
1957	95.92	117.90	128.90	95.92	139.90	203.67	104.88	141.35	99.42	103.26		148.35	174.25
1956	89.27	109.86	120.56	89.27	129.75	194.67	96.35	129.95	92.77	95.17		136.75	157.19
1955	83.75	102.75	113.00	83.75	120.12	183.00	89.50	113.00	87.25	88.50		120.00	144.50
1954	79.75	97.25	107.25	79.75	112.00	179.50	84.50	106.00	83.25	83.50		112.75	134.00
1953	77.60	93.70	103.70	85.34	111.25	179.00	81.20	101.52	80.20	79.75		108.26	129.08
1952	74.52	88.95	98.35	79.51	104.39	176.17	76.17	94.25	75.73	74.73		101.88	123.63
1951	73.00	87.00	96.00	77.60	101.60	174.00	74.00	91.00	74.00	73.00		98.60	120.00
1950	67.50	82.42	88.67	68.33	86.29	150.00	69.42	83.29	70.33	68.42		91.13	107.67
1949	65.22	80.08	88.00	67.75	84.33	155.00	67.55	80.04	68.75	65.24		84.05	105.92
1948	60.17	74.83	82.80	62.40	80.36	135.75	62.84	75.63	63.84	60.17		80.10	107.33
1947	52.60	67.03	74.05	52.60	67.03	116.00	54.60	67.03	55.53	52.53		70.67	84.44
1946	45.03	64.80	79.50	47.33	60.56	104.38	49.46	61.21	49.38	46.38		60.25	69.61
1945	43.92	61.00	73.50	42.00	56.00	100.00	44.25	53.83	44.50	42.00		53.83	67.08
1944	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00		52.00	51.00
1943	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00		52.00	51.00
1942	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00		52.00	51.00
1941	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00		52.00	51.00
1940	41.80	60.80	70.00	41.75	55.75	100.00	43.00	53.00	42.00	42.00		52.00	51.00
1939	41.25	62.08	70.00	41.25	57.08	100.00	43.75	53.33	42.00	42.00		52.00	49.17
1938	45.42	66.67	72.92	45.25	61.08	106.00	47.00	56.00	43.50	43.50		55.00	52.00
1937	47.08	69.92	74.50	47.03	62.75	104.33	48.08	56.75	44.25	44.25		56.92	53.25



FINISHED STEEL—ARITHMETICAL PRICE COMPOSITE

(In dollars per net ton, computed from industry-wide prices on carbon steel: Hot rolled sheets, cold rolled sheets, cold rolled strip, hot rolled bars, plates, structural shapes, basic wire, standard nails, tin plate, and standard and line pipe. Based on basing point prices through June, 1948; mill prices for subsequent months.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
1959	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96	$149.96
1958	145.42	145.42	145.42	145.42	145.42	145.42	145.42	148.55	149.28	149.28	149.96	149.96	147.08
1957	138.60	139.38	139.71	139.71	140.24	140.24	146.10	146.19	146.19	146.03	146.03	145.66	142.84
1956	128.02	128.02	128.02	128.02	128.98	128.98	130.85	136.28	137.75	137.48	137.66	137.79	132.32
1955	117.82	117.82	118.40	118.45	118.45	118.45	124.59	127.41	127.41	128.14	128.14	127.75	122.74
1954	113.91	113.91	113.75	113.70	113.70	113.20	117.52	117.74	117.77	117.95	117.95	117.95	115.75
1953	110.98	110.98	110.98	110.98	111.13	112.49	112.51	115.56	115.56	115.42	115.18	114.41	113.02
1952	106.32	106.32	106.32	106.32	106.32	106.32	107.25	110.98	110.98	110.98	110.98	110.98	108.34
1951	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32
1950	92.92	93.09	93.18	93.19	93.65	94.35	94.36	94.44	94.50	94.91	95.09	100.76	94.54
1949	97.75	97.77	97.17	94.18	93.36	92.06	91.82	91.62	91.55	91.62	91.64	91.89	93.54
1948	78.26	79.86	81.14	81.14	80.27	80.27	86.18	95.05	95.05	95.05	95.16	95.50	86.91

STEELMAKING SCRAP PRICE COMPOSITE

(Average of No. 1 heavy melting steel scrap prices, per gross ton, at Pittsburgh, Chicago, eastern Pennsylvania. December and 1959 averages are estimated.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
1959	$40.58	$42.58	$40.40	$34.96	$33.58	$36.07	$38.45	$38.64	$41.25	$44.00	$44.33	$42.00	$39.74
1958	34.10	37.33	35.83	33.08	33.21	35.50	37.54	41.58	42.87	42.25	41.42	39.47	37.85
1957	58.96	53.41	49.63	43.57	45.75	54.89	54.67	53.33	47.73	37.37	33.17	32.77	47.10
1956	52.17	48.96	51.21	54.90	50.34	46.04	47.70	57.13	59.08	57.27	61.83	64.29	54.16
1955	34.95	36.79	37.50	36.73	34.87	35.44	39.67	43.97	44.42	45.17	46.08	50.37	40.50
1954	29.05	26.91	24.37	25.67	28.00	27.92	27.42	28.80	29.94	32.25	33.33	32.58	28.85
1953	43.00	43.00	44.05	42.58	39.17	40.50	43.51	43.40	36.93	32.75	35.00	32.10	39.69
1952	43.00	43.00	43.00	43.00	43.00	42.63	42.60	43.00	43.00	43.00	43.00	43.00	42.94
1951	46.33	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	43.60	43.00	43.00	43.99
1950	26.93	27.52	28.23	29.40	33.82	39.25	37.04	40.00	40.93	41.37	41.32	45.50	35.94
1949	41.54	38.48	34.60	24.06	22.29	20.85	19.21	20.86	26.07	26.71	28.96	28.03	27.64
1948	40.75	40.48	40.21	40.41	40.67	40.67	41.43	43.33	43.33	43.25	43.25	43.25	41.75

BASIC PIG IRON PRICE COMPOSITE

(Average of basic pig iron prices, per gross ton, at Bethlehem, Pa., Birmingham, Buffalo, Chicago, Cleveland, Pittsburgh, Granite City, Ill., Youngstown.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
1959	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99	$65.99
1958	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99
1957	62.18	62.18	64.17	64.24	64.24	64.24	65.29	65.99	65.99	65.99	65.99	65.99	64.71
1956	58.49	58.49	56.63	59.80	59.80	59.80	59.93	62.18	62.18	62.18	62.18	62.18	60.32
1955	56.04	56.04	56.04	56.04	56.04	56.04	57.88	58.49	58.49	58.49	58.49	58.49	57.29
1954	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04
1953	54.66	54.66	54.66	54.66	54.66	54.66	56.03	56.04	56.04	56.04	56.04	56.04	55.35
1952	52.16	52.16	52.16	52.16	52.16	52.16	52.66	54.66	54.66	54.66	54.66	54.66	53.24
1951	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16
1950	45.70	45.97	45.97	45.97	45.97	45.97	45.97	45.97	47.08	47.98	49.04	52.16	46.98
1949	46.26	46.22	46.22	46.16	45.66	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.81

MALLEABLE PIG IRON PRICE COMPOSITE

(Average of malleable pig iron prices, per gross ton, at Bethlehem, Pa., Buffalo, Chicago, Cleveland, Pittsburgh, Granite City, Ill., Youngstown.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
1959	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27	$67.27
1958	67.27	67.27	67.27	67.27	67.27	67.27	67.27	67.27	67.27	67.27	67.27	67.27	67.27
1957	63.41	63.41	65.70	65.77	65.77	65.77	66.66	67.27	67.27	67.27	67.27	67.27	66.07
1956	59.77	59.77	59.93	61.27	61.27	61.27	61.52	63.41	63.41	63.41	63.41	63.41	61.82
1955	57.27	57.27	57.27	57.27	57.27	57.27	59.15	59.77	59.77	59.77	59.77	59.77	58.47
1954	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27
1953	55.77	55.77	55.77	55.77	55.77	55.77	57.27	57.27	57.27	57.27	57.27	57.27	56.52
1952	53.27	53.27	53.27	53.27	53.27	53.27	53.77	55.77	55.77	55.77	55.77	55.77	54.35
1951	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27
1950	47.27	47.27	47.27	47.27	47.27	47.27	47.33	47.49	48.15	49.46	50.27	53.27	48.30
1949	47.39	47.34	47.34	47.31	47.27	47.27	47.27	47.27	47.27	47.27	47.27	47.27	47.30

No. 2 FOUNDRY PIG IRON PRICE COMPOSITE

(Average of No. 2 foundry pig iron prices, per gross ton, at Bethlehem, Pa., Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Pa., Granite City, Ill.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
1959	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49	$66.49
1958	66.49	66.49	66.49	66.49	66.49	66.49	66.49	66.49	66.49	66.49	66.49	66.49	66.49
1957	62.63	62.63	64.63	64.70	64.70	64.70	65.77	66.49	66.49	66.49	66.49	66.49	65.18
1956	58.99	58.99	59.15	60.27	60.27	60.27	60.95	62.63	62.63	62.63	62.63	62.63	61.00
1955	56.54	56.54	56.54	56.54	56.54	56.54	58.38	58.99	58.99	58.99	58.99	58.99	57.71
1954	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54
1953	55.04	55.04	55.04	55.04	55.04	55.04	56.54	56.54	56.54	56.54	56.54	56.54	55.79
1952	52.54	52.54	52.54	52.54	52.54	52.54	53.04	55.04	55.04	55.04	55.04	55.04	53.62
1951	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54
1950	46.20	46.47	46.47	46.47	46.47	46.47	46.57	46.85	47.55	49.20	49.54	52.54	47.57
1949	47.39	47.34	47.34	47.31	47.27	47.27	46.08	46.10	46.10	46.10	46.10	46.10	46.28
1948	38.94	39.77	39.81	39.68	40.10	40.96	41.83	44.47	44.58	46.50	46.69	46.69	42.50

Prices

METALWORKING FACTS AND FIGURES

AVERAGE MONTHLY QUOTATIONS IN 1959

(Unless otherwise noted, finished steel prices are cents per pound; semifinished steel, coke, and ammonium sulfate are dollars per net ton; other coal chemicals are in cents per unit stated; and pig iron and scrap in dollars per gross ton. All prices are mill or furnace, unless otherwise noted. December figures are subject to revision.)

PITTSBURGH	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Structural Shapes	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Plates	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
Bars, Hot Rolled, Merchant Quality	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675
Bars, Cold Finished	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.65
Sheets, Hot Rolled	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
Sheets, Cold Rolled	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275
Sheets, Galvanized	6.875	6.875	6.875	6.875	6.875	6.875	6.875	6.875	6.875	6.875	6.875	6.875
Strip, Hot Rolled	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
Strip, Cold Rolled	7.425	7.425	7.425	7.425	7.425	7.425	7.425	7.425	7.425	7.425	7.425	7.425
Standard Spikes	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Plain Wire	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Wire Nails	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95
Structural Rivets	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85	12.85
Steel Pipe, Buttweld, 1-3 in.; % discount from list	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
Tin Plate, 1.50-lb coating (base box)	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65	$10.65
Pig Iron, Bessemer, Pittsburgh district ovens	67.00	67.00	67.00	67.00	67.00	67.00	67.00	67.00	67.00	67.00	67.00	67.00
Pig Iron, Basic, Pittsburgh district ovens	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00
Pig Iron, No. 2 Foundry, Neville Island, Pa.	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50
Pig Iron, Malleable, Neville Island, Pa.	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50
Blast Furnace Silvery Pig Iron, 9.01-9.50% Si, Jackson, Ohio, furnace	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50
Billets, Bessemer, and Open Hearth, Rerolling	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00
Wire Rods (cents per pound)	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40
Coke, Furnace, Beehive, spot, Connellsville, Pa.	15.13	15.09	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Coke, Foundry, Beehive, spot, Connellsville, Pa.	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25
Scrap, No. 1 Heavy Melting Steel	43.00	43.75	41.70	36.50	34.50	35.90	39.50	38.50	41.50	44.50	43.70	40.50
Scrap, Low Phos. (Punchings and Plate)	49.75	53.00	51.90	47.00	44.00	47.10	49.50	49.30	49.75	52.63	55.50	54.50
Scrap, No. 1 Cupola	44.50	45.25	45.50	45.50	45.50	45.50	45.25	46.70	47.50	48.75	50.10	50.00

CHICAGO	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Bars, Hot Rolled, Merchant Quality	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675
Plates	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
Structural Shapes	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Bars, Merchant, Rail Steel	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675	5.675
Sheets, Cold Rolled	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275
Pig Iron, No. 2 Foundry	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50	$66.50
Pig Iron, Malleable	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50
Oven Foundry Coke, delivered from St. Paul	33.96	34.73	34.73	34.73	34.73	34.73	34.73	34.69	34.68	34.68	34.68	34.68
Scrap, No. 1 Heavy Melting Steel	42.50	44.00	41.50	34.63	32.75	35.10	36.50	36.90	40.50	42.75	44.30	42.00
Scrap, Rails for Rerolling	62.50	64.25	62.10	58.00	56.25	58.90	59.50	60.70	62.50	64.50	64.50	64.50
Scrap, No. 1 Cupola Cast	46.75	49.50	48.30	45.75	47.50	51.50	52.50	53.30	55.75	57.25	57.30	56.50

EASTERN PENNSYLVANIA	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Plates, Sparrows Point, Md.	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
Structural Shapes, deld. Philadelphia	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77
Steel Bars, deld. Philadelphia	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975
Sheets, Hot Rolled, Sparrows Point, Md.	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
Pig Iron, Basic, deld. Philadelphia	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41	$70.41
Pig Iron, No. 2 Foundry, deld. Philadelphia	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91
Pig Iron, Standard Low Phos. deld. Philadelphia	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67
Oven Foundry Coke, Kearny, N. J.	30.50	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25
Scrap, No. 1 Heavy Melting Steel	36.25	40.00	38.00	33.75	33.50	37.20	39.50	40.00	41.75	44.75	45.00	42.50
Scrap, No. 1 Cupola Cast	38.88	41.00	41.00	41.00	41.00	41.00	41.00	41.00	41.88	45.50	46.20	45.00
Spiegeleisen, 19-21%, Palmerton, Pa., furnace	102.50	102.50	102.50	102.50	102.50	102.50	102.50	102.50	102.50	102.50	102.50	102.50

COAL CHEMICALS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Benzene, per gallon, producers' plants, tank lots	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Toluene, 1 degree, per gallon, deld. east of Rockies	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Xylene, per gallon, producers' plants, tank lots	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
Phenol, 90 per cent grade, per lb, producers' plants	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50
Ammonium Sulfate, per ton, bulk, ovens	39.50	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00

Nonferrous Prices

METALWORKING FACTS AND FIGURES

NONFERROUS METAL PRICES

(Cents per pound)

	1959 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.*	Yearly Averages 1959*	1958	1957
Copper Sheets[1]	53.13	54.13	55.33	55.63	55.63	55.63	54.51	53.93	54.26	54.63	56.43	57.13	55.03	49.48	52.51
Copper Rods[7]	50.36	51.36	52.56	52.86	52.86	52.86	51.74	51.36	52.49	52.86	54.36	54.86	52.54	46.71	49.74
Copper Tubing[1]	53.39	54.32	55.52	55.82	55.82	55.82	54.70	54.32	55.45	55.82	57.62	58.32	55.58	49.68	52.70
Yellow Brass Sheets[1]	46.57	47.40	48.07	48.24	48.24	48.24	47.49	47.24	48.05	48.65	50.04	50.57	48.23	43.63	45.83
Yellow Brass Rods[1]	31.22	31.99	32.58	32.73	32.73	32.73	32.04	32.21	33.60	34.21	35.54	36.06	33.14	30.28	34.72
Yellow Brass Tubing[1]	49.98	50.81	51.48	51.65	51.65	51.65	50.90	50.65	51.46	52.06	53.60	54.23	51.68	46.59	48.74
Nickel Silver Sheets[2]	62.20	62.97	63.65	63.82	63.82	63.82	63.09	62.85	63.62	64.13	65.46	65.98	63.78	58.93	62.37
Phosphor Bronze Sheets[4]	72.59	73.82	75.04	75.34	75.34	75.34	74.28	73.92	74.99	75.34	76.87	77.44	75.03	68.53	71.53
Zinc Sheets[1]	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	24.17	24.00
Bronze Sheets[3]	51.65	52.60	53.64	53.90	53.90	53.90	52.89	52.55	53.58	54.02	55.59	56.17	53.70	48.21	50.99
Bronze Rods[3]	51.59	52.54	53.58	53.84	53.84	53.84	52.83	52.49	53.52	53.96	55.38	55.86	53.61	48.15	50.93
Bronze Tubing[3]	54.71	55.66	56.70	56.96	56.96	56.96	55.95	55.61	56.64	57.08	58.80	59.48	56.79	50.82	53.55
Yellow Brass Wire[1]	47.11	47.94	48.61	48.78	48.78	48.78	48.03	47.78	48.59	49.19	50.43	50.86	48.74	44.17	46.37
Weatherproof Copper Wire[5]	35.54	36.29	37.19	37.42	37.42	37.42	36.57	36.29	37.14	37.42	38.21	38.55	37.12	33.44	36.32
Bare Copper Wire[5]	34.35	35.35	36.58	36.89	36.89	36.89	35.74	35.36	36.48	36.85	37.90	38.35	36.47	31.575	35.568
No. 115 Brass Ingots[6]	28.00	28.75	31.50	31.00	30.25	30.25	29.25	29.25	30.00	29.25	30.45	30.75	29.89	26.71	29.90
No. 305 Brass Ingots[6]	32.25	33.00	35.75	35.25	34.50	34.50	33.50	33.50	34.25	33.50	34.90	35.25	34.18	30.86	33.71
No. 405 Brass Ingots[6]	23.00	23.63	25.80	25.44	24.75	24.75	23.75	23.75	24.75	23.75	24.55	24.75	24.39	22.19	24.27

*Estimated.
[1]F.o.b. mill. [2]90% Cu, f.o.b. mill. [3]10% Ni, f.o.b. mill. [4]Grade A, f.o.b. mill. [5]Car lots, f.o.b. eastern mill. [6]Delivered. [7]Cold-drawn, f.o.b. mill.

COPPER

(Electrolytic; cents per lb, delivered Connecticut Valley)

	1959	1958	1957	Yearly Averages
Jan.	29.212	25.135	35.433	1959* 31.275
Feb.	30.159	24.298	32.863	1958 26.095
Mar.	32.031	24.163	31.462	1957 29.611
Apr.	32.404	24.323	31.598	1956 42.446
May	31.750	24.433	31.087	1955 38.217
June	31.490	25.400	30.250	1954 29.777
July	30.048	26.125	28.822	1953 29.037
Aug.	30.010	26.510	28.639	1952 24.500
Sept.	31.500	26.428	26.469	1951 24.500
Oct.	31.278	28.058	26.361	1950 21.588
Nov.	32.420	29.415	26.217	1949 19.499
Dec.	33.000	28.856	26.130	1948 22.317

ZINC

(Prime western; cents per lb, East St. Louis, Ill.)

	1959	1958	1957	Yearly Averages
Jan.	11.500	10.000	13.500	1959* 11.461
Feb.	11.409	10.000	13.500	1958 10.313
Mar.	11.000	10.000	13.500	1957 11.397
Apr.	11.000	10.000	13.500	1956 13.495
May	11.000	10.000	11.923	1955 12.303
June	11.000	10.000	10.840	1954 10.721
July	11.000	10.000	10.000	1953 10.851
Aug.	11.000	10.000	10.000	1952 16.213
Sept.	11.360	10.000	10.000	1951 17.994
Oct.	12.259	10.865	10.000	1950 13.879
Nov.	12.500	11.386	10.000	1949 12.152
Dec.	12.500	11.500	10.000	1948 13.563

MAGNESIUM

(99.8% primary pig; cents per lb, f.o.b. Velasco, Tex.)

	1959	1958	1957	1956	1955
Jan.	35.250	35.250	35.250	32.500	27.000
Feb.	35.250	35.250	35.250	32.500	27.000
Mar.	35.250	35.250	35.250	32.500	27.556
Apr.	35.250	35.250	35.250	33.150	28.500
May	35.250	35.250	35.250	33.750	28.500
June	35.250	35.250	35.250	33.750	28.500
July	35.250	35.250	35.250	33.750	28.500
Aug.	35.250	35.250	35.250	34.694	30.574
Sept.	35.250	35.250	35.250	35.250	32.500
Oct.	35.250	35.250	35.250	35.250	32.500
Nov.	35.250	35.250	35.250	35.250	32.500
Dec.	35.250	35.250	35.250	35.250	32.500
Avg	35.250	35.250	35.250	33.966	29.678

ANTIMONY

(Domestic, bulk, 99.5% car lots; cents per lb, f.o.b. Laredo, Tex.)

	1959	1958	1957	Yearly Averages
Jan.	29.000	33.000	33.000	1959* 29.000
Feb.	29.000	30.250	33.000	1958 29.438
Mar.	29.000	29.000	33.000	1957 33.000
Apr.	29.000	29.000	33.000	1956 33.000
May	29.000	29.000	33.000	1955 30.150
June	29.000	29.000	33.000	1954 28.500
July	29.000	29.000	33.000	1953 33.932
Aug.	29.000	29.000	33.000	1952 42.112
Sept.	29.000	29.000	33.000	1951 42.335
Oct.	29.000	29.000	33.000	1950 27.626
Nov.	29.000	29.000	33.000	1949 36.875
Dec.	29.000	29.000	33.000	1948 35.010

*Estimated.

ALUMINUM

(99.5% primary pig; cents per lb, f.o.b. shipping point)

	1959	1958	1957	Yearly Averages
Jan.	24.70	26.00	25.00	1959* 24.70
Feb.	24.70	26.00	25.00	1958 24.79
Mar.	24.70	26.00	25.00	1957 25.42
Apr.	24.70	24.00	25.00	1956 24.03
May	24.70	24.00	25.00	1955 21.88
June	24.70	24.00	25.00	1954 20.20
July	24.70	24.00	25.00	1953 19.70
Aug.	24.70	24.70	26.00	1952 18.40
Sept.	24.70	24.70	26.00	1951 18.00
Oct.	24.70	24.70	26.00	1950 16.70
Nov.	24.70	24.70	26.00	1949 16.00
Dec.	24.70	24.70	26.00	1948 14.73

LEAD

(Common grade; cents per lb, St. Louis)

	1959	1958	1957	Yearly Averages
Jan.	12.415	12.800	15.800	1959* 12.049
Feb.	11.368	12.800	15.800	1958 11.917
Mar.	11.238	12.800	15.800	1957 14.459
Apr.	10.992	11.800	15.800	1956 15.813
May	11.700	11.512	15.185	1955 14.940
June	11.800	11.040	14.120	1954 13.854
July	11.800	10.800	13.800	1953 13.283
Aug.	12.069	10.646	13.800	1952 16.268
Sept.	12.800	10.730	13.800	1951 17.294
Oct.	12.800	12.473	13.504	1950 13.095
Nov.	12.800	12.800	13.300	1949 15.191
Dec.	12.800	12.800	12.800	1948 17.867

COBALT

(97-99%; dollars per lb for 550 lb keg)

	1959	1958	1957	1956	1955	1954
Jan.	2.00	2.00	2.54	2.60	2.60	2.60
Feb.	1.88	2.00	2.35	2.60	2.60	2.60
Mar.	1.75	2.00	2.35	2.60	2.60	2.60
Apr.	1.75	2.00	2.35	2.60	2.60	2.60
May	1.75	2.00	2.26	2.60	2.60	2.60
June	1.75	2.00	2.00	2.60	2.60	2.60
July	1.75	2.00	2.00	2.60	2.60	2.60
Aug.	1.75	2.00	2.00	2.60	2.60	2.60
Sept.	1.75	2.00	2.00	2.60	2.60	2.60
Oct.	1.75	2.00	2.00	2.60	2.60	2.60
Nov.	1.75	2.00	2.00	2.60	2.60	2.60
Dec.	1.75	2.00	2.00	2.60	2.60	2.60
Avg	1.78	2.00	2.15	2.60	2.60	2.60

SILVER

(Open market, cents per fine ounce, New York)

	1959	1958	1957	Yearly Averages
Jan.	90.219	89.438	91.375	1959* 91.205
Feb.	90.438	88.625	91.375	1958 89.034
Mar.	91.375	88.625	91.375	1957 90.846
Apr.	91.375	88.625	91.375	1956 90.839
May	91.375	88.625	91.375	1955 89.062
June	91.375	88.625	90.500	1954 85.250
July	91.375	88.625	90.250	1953† 85.188
Aug.	91.425	88.625	90.938	1952† 84.941
Sept.	91.375	88.625	90.625	1951† 89.368
Oct.	91.375	89.875	90.625	1950† 74.165
Nov.	91.375	90.125	90.344	1949† 71.930
Dec.	91.375	89.975	90.000	1948† 74.361

*Estimated.
†As reported by Handy & Harman, New York.

NICKEL

(Electrolytic cathodes, 99.5%, base sizes, unpacked; cents per lb, f.o.b. refinery)

	1959	1958	1957	Yearly Averages
Jan.	74.000	74.000	74.000	1959* 74.000
Feb.	74.000	74.000	74.000	1958 74.000
Mar.	74.000	74.000	74.000	1957 74.000
Apr.	74.000	74.000	74.000	1956 65.032
May	74.000	74.000	74.000	1955 64.500
June	74.000	74.000	74.000	1954 60.450
July	74.000	74.000	74.000	1953 59.888
Aug.	74.000	74.000	74.000	1952 56.500
Sept.	74.000	74.000	74.000	1951 54.000
Oct.	74.000	74.000	74.000	1950 44.809
Nov.	74.000	74.000	74.000	1949 40.000
Dec.	74.000	74.000	74.000	1948 36.528

TIN

(Straits, spot; cents per lb, New York)

	1959	1958	1957	Yearly Averages
Jan.	99.409	92.933	101.480	1959* 102.076
Feb.	102.364	93.818	101.159	1958 95.086
Mar.	103.000	93.425	99.683	1957 96.317
Apr.	102.490	93.021	99.276	1956 101.517
May	103.080	94.510	98.341	1955 94.939
June	104.284	94.701	98.080	1954 91.936
July	102.298	94.950	96.576	1953 95.925
Aug.	102.333	94.995	94.259	1952 120.492
Sept.	102.440	94.120	93.422	1951 127.072
Oct.	102.231	96.500	91.843	1950 95.552
Nov.	100.985	99.034	89.288	1949 99.996
Dec.	100.000	99.019	92.395	1948 99.250

IRIDIUM

(Dollars per troy ounce)

	1959	1958	1957	1956	1955
Jan.	75.00	87.50	100.00	110.00	115.00
Feb.	75.63	80.00	105.00	106.25	121.50
Mar.	77.50	80.00	105.00	105.00	105.00
Apr.	77.50	80.00	105.00	105.00	105.00
May	77.50	76.25	105.00	105.00	103.00
June	77.50	75.00	103.75	105.00	95.00
July	77.50	75.00	100.00	105.00	95.00
Aug.	77.50	75.00	105.00	100.00	97.00
Sept.	77.50	75.00	99.40	100.00	100.00
Oct.	77.50	75.00	98.00	100.00	102.00
Nov.	77.50	75.00	95.75	100.00	110.00
Dec.	77.50	75.00	95.00	104.00	110.00
Avg	77.14	77.40	101.40	103.77	104.88

PLATINUM

(Dollars per ounce)

	1959	1958	1957	1956	1955	1954
Jan.	53.50	78.00	102.00	106.50	82.13	92.00
Feb.	58.50	75.25	98.75	104.50	81.00	92.00
Mar.	77.20	72.70	93.50	104.00	78.00	87.90
Apr.	78.50	71.13	93.50	103.90	78.00	85.50
May	78.50	67.75	93.13	105.75	77.90	85.50
June	78.50	66.40	92.25	106.50	78.13	85.50
July	78.50	64.75	90.70	106.50	81.38	85.50
Aug.	78.50	63.50	84.75	106.50	83.50	83.50
Sept.	78.50	62.25	84.00	106.00	90.63	85.50
Oct.	78.50	58.50	84.00	105.50	94.30	85.50
Nov.	78.50	57.25	84.00	105.50	102.75	85.50
Dec.	78.50	53.50	78.50	104.60	107.00	101.00
Avg	74.64	67.582	89.92	105.48	86.23	86.60

*Estimated.

Nonferrous Metals

METALWORKING FACTS AND FIGURES

COPPER PRODUCTION, SHIPMENTS & STOCKS

(DOMESTIC STATISTICS—net tons)

Period	PRODUCTION Primary	PRODUCTION Secondary	PRODUCTION Refined	Deliveries to Customers	Refined Stocks End of Period
1959					
10 Mo..	760,967	103,222	1,138,011	1,138,663	78,308
Jan. ..	95,542	11,284	137,361	114,425	80,780
Feb. ..	88,432	11,425	142,235	120,134	85,523
Mar. ..	101,410	16,120	140,928	124,220	82,952
Apr. ..	98,376	14,287	137,490	135,233	74,323
May ..	104,236	9,933	135,031	135,135	86,132
June ..	99,419	11,352	138,403	150,117	85,674
July ..	81,662	8,323	134,020	108,127	103,432
Aug. ..	51,327	3,994	83,677	90,123	94,109
Sept. ..	19,503	6,578	44,648	92,501	79,826
Oct. ..	21,060	9,926	44,218	68,648	78,308
1958	1,008,170	131,294	1,446,540	1,179,416(a)	80,722
1957	1,116,380	112,060	1,616,964	1,277,946(a)	181,024
1956	1,133,134	139,584	1,580,387	1,465,999(a)	120,645
1955	1,036,702	124,760	1,467,448	1,446,354(a)	61,554
1954	863,721	102,472	1,311,031	1,208,755(a)	47,108
1953	957,318	110,475	1,395,003	1,443,719(a)	89,193
1952	961,886	46,003	1,189,112	1,445,834(a)	58,858
1951	964,589	56,910	1,199,784	1,367,787	71,528
1950	940,249	117,439	1,270,768	1,371,464	49,040
1949	772,986	135,052	1,056,463	1,031,595	116,027

(FOREIGN STATISTICS—net tons)

Period	PRODUCTION Primary	PRODUCTION Secondary	PRODUCTION Refined	Deliveries to Customers	Refined Stocks End of Period
1959					
10 Mo..	1,694,784	11,027	1,398,536	1,386,987	252,130
Jan. ..	162,140	1,093	133,634	134,149	203,765
Feb. ..	155,973	1,312	121,783	123,607	218,780
Mar. ..	168,838	899	144,497	146,548	236,289
Apr. ..	167,561	1,366	141,469	135,029	255,548
May ..	175,393	1,762	147,993	131,243	264,211
June ..	178,387	995	146,017	144,115	259,755
July ..	175,067	875	140,732	122,397	286,736
Aug. ..	181,617	558	142,276	147,821	284,540
Sept. ..	167,334	1,074	142,646	139,781	275,100
Oct. ..	162,474	1,093	137,489	142,297	252,130
1958	1,705,242	7,402	1,364,568	1,738,988	181,822
1957	1,781,339	11,210	1,418,624	1,575,361	277,316
1956	1,729,705	12,952	1,406,773	1,366,979	233,775
1955	1,576,960	8,305	1,260,861	1,298,037	159,777
1959	**Total Domestic & Foreign**				
10 Mo..	2,455,751	114,249	2,536,547	2,505,650	330,438
1958	2,713,412	138,696	2,811,108	2,918,404	262,544
1957	2,897,719	123,270	3,035,588	2,853,307	458,340
1956	2,862,839	152,536	2,987,160	2,832,978	354,420
1955	2,613,662	133,065	2,728,309	2,744,391	221,331

Copper Institute. (a)—Includes tonnages delivered from government stocks and by importers.

Imports of Copper

(Unrefined, scrap, refined, net tons)

	1959	1958	1957	1956	1955	1954
Jan.	43,860	53,182	58,502	32,195	39,307	34,790
Feb.	31,270	47,603	43,088	48,674	46,082	55,868
Mar.	37,155	48,945	55,338	44,170	45,273	43,384
Apr.	31,544	52,627	58,292	47,881	44,027	45,975
May	35,813	31,698	48,377	52,446	45,340	51,989
June	60,344	58,900	40,963	52,992	49,368	81,833
July	43,933	33,705	54,303	49,324	46,581	62,228
Aug.	38,449	29,414	47,899	58,091	55,089	55,391
Sept.	76,729	34,346	42,390	47,882	63,663	54,436
Oct.	.....	28,194	54,741	63,686	52,500	30,805
Nov.	.....	47,798	46,650	41,652	57,114	43,540
Dec.	.....	40,803	47,720	60,226	58,050	46,755
Monthly Avg	.....	42,268	49,855	49,935	50,200	50,583

U. S. Bureau of the Census.

Exports of Copper

(Refined, scrap, brass, and bronze, net tons)

	1959	1958	1957	1956	1955	1954
Jan.	27,921	30,265	43,298	18,554	26,929	30,472
Feb.	25,034	21,056	40,981	21,659	37,375	25,499
Mar.	22,992	27,539	57,151	21,686	25,673	19,043
Apr.	24,172	27,987	50,077	18,040	27,095	31,235
May	19,201	43,482	44,775	30,303	30,233	29,712
June	16,045	25,192	47,268	17,703	19,323	26,046
July	13,580	30,326	34,519	16,172	13,819	24,183
Aug.	21,716	43,851	28,135	24,047	15,399	27,121
Sept.	.....	36,618	29,965	27,556	22,294	16,783
Oct.	.....	47,284	25,103	29,312	20,405	25,867
Nov.	.....	49,577	35,689	25,165	19,340	18,883
Dec.	.....	52,329	28,421	49,408	19,142	23,562
Monthly Avg	.....	36,292	38,782	24,967	23,086	24,866

U. S. Bureau of the Census.

Brass Ingot Shipments

(Net tons)

	1959	1958	1957	1956
Jan.	22,046	20,468	25,681	27,736
Feb.	23,746	17,413	20,769	24,949
Mar.	26,109	18,825	21,948	28,310
Apr.	26,115	18,009	23,507	25,808
May	23,967	17,191	22,037	23,437
June	22,922	17,962	18,888	18,842
July	20,346	16,658	16,695	17,364
Aug.	21,741	17,882	19,654	23,812
Sept.	22,685	20,540	19,670	20,929
Oct.	23,067	23,225	22,800	23,045
Nov.	.....	20,758	19,767	21,818
Dec.	.....	18,676	16,875	18,046
Totals	.....	227,607	248,291	274,096

Compiled by Ingot Brass & Bronze Industry, representing in excess of 95 per cent of brass and bronze industry.

Copper Consumption in U. S.

(Refined metal, net tons)

	1958	1957	1956
Brass Mills	479,510	533,954	611,098
Wire Mills	740,270	773,632	864,585
Chemical Plants.	897	1,489	1,758
Secondary Smelters	7,182	7,876	7,654
Foundries	13,883	20,378	18,980
Miscellaneous ..	8,935	14,804	17,314
Totals	1,250,677	1,352,124	1,521,389

U. S. Bureau of Mines.

Copper & Brass Mill Fabricator Statistics

(Net tons)

	DELIVERIES: Deliveries to Users (actual consump.)	DELIVERIES: Producer Deliveries to Fabricators	STOCKS AT END OF PERIOD: Fabricators' Refined Stocks	STOCKS AT END OF PERIOD: Less Working Stocks	STOCKS AT END OF PERIOD: Visible Supplies	STOCKS AT END OF PERIOD: Plus Undelivered Purchases	STOCKS AT END OF PERIOD: Total Stocks and Purchases	Unfilled Orders
1959								
10 Mo.	1,156,067	1,138,663	431,612	347,136	84,476	119,806	204,282	211,359
Jan.	108,556	114,425	457,347	337,761	119,586	101,182	220,768	172,698
Feb.	116,565	120,134	459,046	340,522	118,524	123,321	241,845	183,113
Mar.	133,259	124,220	449,441	334,904	114,537	130,785	245,322	211,547
Apr.	120,680	135,233	463,582	337,282	126,300	125,250	251,550	204,618
May	124,060	135,135	474,657	338,835	135,822	133,694	269,516	210,424
June	132,702	150,117	492,072	343,585	148,487	111,229	259,716	191,875
July	81,500	108,127	518,699	357,474	161,225	100,367	261,592	193,338
Aug.	121,563	90,123	487,259	359,049	128,210	97,786	225,996	191,476
Sept.	116,880	92,501	462,880	360,760	102,120	111,675	213,795	206,254
Oct.	100,302	68,648	431,612	347,136	84,476	119,806	204,282	211,359
1958	1,166,129	1,179,416	446,358	326,438	119,920	90,401	210,321	177,869
Jan.	94,842	110,757	445,514	348,426	97,088	58,217	155,305	124,056
Feb.	87,287	94,446	452,673	351,035	101,638	52,718	154,356	128,766
Mar.	83,694	79,046	448,125	346,875	101,250	71,693	172,943	141,387
Apr.	79,613	81,930	450,442	347,607	102,735	76,602	179,337	145,623
May	88,447	78,631	441,001	346,404	94,597	78,194	172,791	138,190
June	109,010	100,796	433,526	330,301	103,325	72,385	175,610	145,162
July	79,353	77,523	431,796	326,263	105,533	77,362	182,895	153,529
Aug.	96,717	86,982	421,931	323,667	98,264	78,194	176,458	150,436
Sept.	105,474	101,064	416,587	319,281	97,306	77,025	174,331	145,390
Oct.	138,017	120,793	399,113	315,929	83,184	91,019	174,203	156,692
Nov.	110,387	131,188	419,914	328,238	91,676	88,580	180,256	157,799
Dec.	93,338	116,310	446,358	326,438	119,920	90,401	210,321	177,869
1957	1,282,329	1,277,946	430,171	347,465	82,706	75,627	158,333	138,631
1956	1,416,378	1,465,999	437,187	336,217	100,970	117,601	218,571	183,834
1955	1,418,241	1,446,354	389,974	314,145	75,829	139,094	214,923	293,264
1954	1,231,840	1,208,755	360,526	304,619	55,907	58,125	114,032	136,581
1953	1,375,869	1,443,719	380,881	309,664	71,217	25,022	96,239	170,917
1952	1,391,477	1,445,834	331,499	292,157	39,342	32,652	71,994	275,608
1951	1,394,960	1,367,787	280,402	295,385	−14,983	32,147	17,164	303,050
1950	1,438,237	1,371,464	290,241	288,392	1,849	92,372	94,221	313,052
1949	1,053,225	1,031,595	354,992	285,298	69,694	82,793	152,487	189,407
1948	1,394,307	1,344,445	379,346	295,958	83,388	81,496	164,884	315,944
1947	1,338,383	1,383,666	423,432	293,859	129,573	103,765	233,338	338,260

Copper Institute.

Slab Zinc

(Net tons)

Commencing with January, 1948, all regularly operating U. S. primary and secondary smelters are included. Production from foreign ores is included, commencing with 1940.

	Stock Beginning	Production	SHIPMENTS Domestic	Export & Drawback	Gov't. Acc't.	Totals
1959*	190,237	855,000	845,000	10,000	3,000	858,000
Jan.	190,237	76,481	70,770	171	....	70,941
Feb.	195,777	71,174	65,641	849	....	66,490
Mar.	200,461	79,918	73,814	482	....	74,296
Apr.	206,083	76,393	78,358	255	....	78,613
May	203,863	77,489	85,073	275	....	85,348
June	196,004	75,544	99,858	204	2,100	102,162
July	169,386	73,101	59,460	94	900	60,454
Aug.	182,033	69,768	58,918	864	....	59,782
Sept.	192,019	62,202	57,971	3,214	....	61,185
Oct.	193,036	63,938	63,910	1,813	....	65,723
1958	166,660	828,902	767,735	3,102	34,488	805,325
1957	68,622	1,057,450	765,127	14,970	179,446	959,563
1956	40,979	1,062,954	869,270	9,027	157,014	1,035,311
1955	124,277	1,031,018	1,007,619	19,497	87,200	1,114,316
1954	180,843	868,242	787,922	27,929	108,957	924,808
1953	87,160	971,191	818,850	16,326	42,332	877,508
1952	21,901	961,430	803,343	56,202	36,626	896,171
1951	8,884	931,833	836,800	42,067	39,949	918,816
1950	94,221	910,354	849,246	18,189	128,256	995,691
1949	20,848	870,113	648,285	56,929	91,526	796,740
1948	68,647	850,105	770,396	69,910	57,598	897,904
1947	175,800	848,027	698,281	117,305	140,230	955,816
1946	259,391	759,346	714,292	66,638	62,007	842,937
1945	237,520	799,520	762,925	9,422	5,302	777,649
1944	173,510	901,332	830,334	6,988	.....	837,322
1943	89,275	971,873	831,430	56,208	.....	887,638
1942	24,086	929,770	733,918	151,650	.....	885,568
1941	17,582	863,955	751,276	106,195	.....	857,471
1940	74,262	706,100	674,615	88,165	.....	762,780
1939	126,769	538,198	598,972	.....	.....	598,972
1938	65,333	456,990	395,534	20	.....	395,554

American Zinc Institute Inc. *Estimated.

U. S. Lead

(Refiners' stocks, production, shipments; net tons)

	Stock at Beginning	Production (Inc. Secondary)	Total Supply	Domestic Shipments
1959*	198,508	372,000	570,508	427,000
Jan.	198,508	43,652	242,160	33,035
Feb.	208,874	39,498	248,372	30,685
Mar.	214,946	39,238	254,184	40,980
Apr.	210,524	40,606	251,130	52,649
May	197,823	39,101	236,924	65,207
June	171,577	37,459	209,036	75,465
July	133,235	32,882	166,117	22,380
Aug.	142,694	25,589	168,283	43,850
Sept.	124,259	14,801	139,060	21,795
Oct.	117,296	18,892	136,188	20,552
1958	91,598	522,956	614,554	380,350
1957	41,181	604,353	645,534	463,060
1956	31,089	613,293	644,382	524,848
1955	92,719	547,153	639,872	531,339
1954	81,152	551,618	632,770	475,552
1953	43,560	533,883	577,443	488,437
1952	25,339	532,778	558,117	492,094
1951	35,619	486,874	522,493	496,184
1950	70,424	571,763	642,187	499,637
1949	38,644	542,676	581,320	355,905
1948	21,328	511,356	532,684	490,630
1947	47,587	541,065	588,652	566,666
1946	44,867	396,688	441,555	393,904
1945	19,536	524,328	543,864	500,003
1944	33,090	538,618	571,708	552,063
1943	34,937	546,673	581,610	548,417
1942	20,185	633,818	654,003	618,947
1941	40,926	634,888	675,814	655,542
1940	58,777	685,480	644,257	603,143
1939	115,902	497,991	613 893	555,074
1938	129,131	408,539	537,570	421,625
1937	171,856	533,215	705,071	575,933
1936	222,306	463,906	685,312	513,361

American Bureau of Metal Statistics. *Estimated.

Mine Production of Zinc

(Net tons)

	1959	1958	1957	1956	1955
Jan.	35,435	38,676	50,174	41,082	41,005
Feb.	35,709	33,980	46,080	42,703	40,101
Mar.	36,424	35,878	51,057	47,745	46,286
Apr.	37,670	39,677	51,714	44,971	43,721
May	37,670	35,675	47,123	47,286	45,351
June	35,944	33,102	45,490	45,141	43,972
July	31,383	28,776	42,672	43,152	41,854
Aug.	30,591	29,300	42,376	45,532	43,555
Sept.	28,874	30,209	34,779	42,513	43,080
Oct.	....	32,452	39,350	49,600	42,700
Nov.	....	32,391	34,967	46,170	41,083
Dec.	....	32,003	34,346	46,445	41,963
Mo. Avg	....	33,577	43,344	45,195	42,889

U. S. Bureau of Mines.

Mine Production of Lead

(Net tons)

	1959	1958	1957	1956	1955
Jan.	23,397	25,830	30,166	26,822	27,828
Feb.	21,350	23,538	28,987	28,250	27,427
Mar.	21,015	18,126	30,867	30,950	31,315
Apr.	21,192	25,598	31,658	29,705	28,686
May	20,093	24,243	30,091	29,975	28,932
June	21,370	22,620	27,271	29,481	28,427
July	19,539	20,996	27,231	27,969	25,783
Aug.	21,648	19,455	27,718	30,630	26,813
Sept.	20,348	19,360	24,902	27,415	26,876
Oct.	....	20,960	28,414	31,520	27,564
Nov.	....	22,929	23,308	28,503	25,975
Dec.	....	21,865	22,880	27,109	27,802
Mo. Avg	....	22,110	27,791	29,402	28,169

U. S. Bureau of Mines.

Titanium

(Domestic production, net tons)

	Sponge		Mill Products
1959*	4,000	1959*	3,000
1958	4,585	1958	2,594
1957	17,249	1957	5 658
1956	14,595	1956	5,166
1955	7,398	1955	1,898
1954	5,370	1954	1,299
1953	2,241	1953	1,114
1952	1,075	1952	250

U. S. Bureau of Mines. *Estimated.

CONSUMPTION OF SLAB ZINC IN U. S.

(Net tons)

1959	Galvanizing	Brass & Bronze Products	Rolled Zinc	Die-casting	Miscellaneous	Totals
Jan.	31,729	11,172	3,874	29,110	3,621	79,506
Feb.	31,672	11,508	3,418	26,448	3,964	77,010
Mar.	37,287	12,889	3,629	29,286	4,303	87,394
Apr.	38,541	12,304	3,715	31,262	4,323	90,145
May	38,788	12,015	3,316	29,169	4,805	88,093
June	40,531	10,764	3,801	38,269	4,620	95,985
July	23,700	7,558	2,509	28,120	3,542	65,429
Aug.	13,763	10,064	3,160	29,803	3,661	60,451
Sept.	8,952	9,658	2,059	5,922	4,679	31,270
1958	381,229	101,375	40,616	316,830	28,277	868,327
1957	367,757	112,390	41,269	376,039	38,165	935,620
1956	439,146	124,004	47,359	360,507	37,774	1,008,790
1955	439,697	144,816	50,363	404,790	45,002	1,084,668
1954	398,599	107,293	45,979	286,817	37,442	876,130

CONSUMPTION OF LEAD IN U. S.—1958-59

(Net tons)

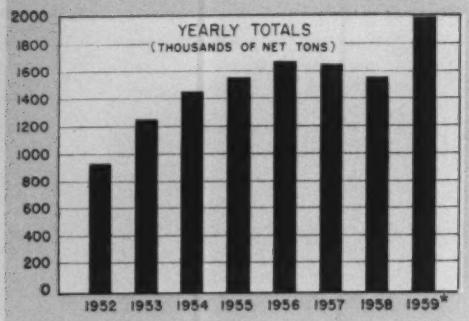
Metal Products	Total 1958	1959 Jan.	Feb.	Mar.	Apr.	May	June	July
Ammunition	40,215	3,569	3,520	3,899	4,224	3,841	3,674	3,486
Bearing Metals	18,980	1,683	1,800	1,966	2,059	2,035	1,922	1,764
Brass & Bronze	20,379	1,789	1,895	2,283	2,386	2,102	2,068	1,769
Cable Covering	74,981	5,287	4,918	5,818	6,248	5,432	5,791	3,183
Calking Lead	70,807	5,472	5,331	5,307	6,312	9,092	8,076	6,349
Casting Metals	8,674	784	721	635	732	470	540	525
Collapsible Tubes	8,432	384	679	697	976	915	919	453
Foil	4,586	336	306	250	329	297	375	284
Pipe, Traps & Bends	23,044	1,722	1,759	1,795	2,059	2,108	2,125	1,868
Sheet Lead	25,104	2,152	2,259	2,350	2,577	2,585	2,511	2,185
Solder	59,653	5,231	5,284	5,568	5,756	5,107	6,075	6,888
Storage Batteries:								
Antimonial Lead	159,795	15,011	13,670	13,110	12,983	15,709	15,425	16,167
Oxides	152,930	15,943	14,083	13,517	13,353	14,076	15,567	14,107
Terne Metal	1,227	151	244	95	233	113	202	143
Type Metal	26,740	2,058	2,341	2,384	2,367	2,159	2,300	2,010
Total Metal Products	695,547	61,572	58,810	59,674	62,594	66,041	67,570	61,181
Pigments	95,901	6,145	9,012	8,084	10,745	10,088	10,265	8,719
Chemicals	162,645	16,418	12,148	12,723	13,118	15,387	13,305	15,647
Miscellaneous Uses†	32,294	4,227	4,253	4,617	4,814	4,650	4,663	4,019
Total Consumed†	986,387	88,400	84,200	85,100	91,300	96,200	95,800	89,600

U. S. Bureau of Mines. †Partly estimated.

Nonferrous Metals

METALWORKING FACTS AND FIGURES

PRIMARY ALUMINUM PRODUCTION



(Net tons)

	1959	1958	1957	1956	1955	1954	1953
Jan.	156,700	139,910	147,029	140,394	128,203	116,247	89,895
Feb.	142,116	121,980	119,059	132,763	116,236	110,483	92,649
Mar.	157,189	134,019	135,706	145,895	130,272	122,339	104,460
Apr.	155,213	124,999	139,152	144,726	126,394	120,434	102,071
May	163,857	126,327	145,174	150,800	131,128	125,138	105,464
June	167,323	115,326	138,007	145,726	127,634	120,758	104,152
July	179,194	118,541	142,041	151,624	132,669	126,161	109,285
Aug.	172,817	125,416	143,449	92,406	133,551	125,296	110,545
Sept.	168,205	124,714	129,278	132,316	130,606	120,332	109,333
Oct.	173,762	139,847	133,759	149,125	134,655	125,089	108,219
Nov.	.....	140,962	135,024	145,081	133,689	121,252	105,636
Dec.	.....	152,301	140,036	148,391	140,748	127,035	110,291
Totals	1,990,000*	1,565,556	1,647,714	1,679,247	1,565,785	1,460,564	1,252,000

Yearly totals reflect adjustments and in some instances vary slightly from the sums of monthly figures. *Estimated. U. S. Bureau of Mines.

Secondary Aluminum Production

(Net tons)

	From New Scrap	From Old Scrap	Total	As Metal	As Alloys†
1958	225,428	64,127	289,555	7,924	281,631
1957	289,360	72,459	361,819	9,218	352,601
1956	268,095	71,673	339,768	9,471	330,297
1955	259,622	76,372	335,994	9,023	326,971
1954	232,052	59,989	292,041	5,752	286,289
1953	289,626	78,940	368,566	5,203	363,363
1952	253,258	71,264	304,522	4,897	299,625
1951	216,017	76,591	292,608	5,341	287,267
1950	167,308	76,358	243,666	2,140	241,526
1949	136,166	44,596	180,762	343	180,419
1948	191,129	95,648	286,777	2,384	284,393
1947	180,990	163,847	344,837	5,105	339,732

†Also includes chemical compounds.
U. S. Bureau of Mines.

Bauxite Production and Imports

(Gross tons. Quarterly figures are preliminary, and their sums differ slightly from final annual totals)

	—Mine Production (dried equiv.)— Arkansas	Ala., Ga., Va.	Totals	Imports as Shipped	Total New Supply
1959					
1st Qtr	350,696	11,821	362,517	1,975,508	2,338,025
2nd Qtr	427,891	14,988	442,879	1,907,642	2,350,521
1958	1,257,916	52,769	1,310,685	7,918,938	9,229,623
1st Qtr	288,729	10,720	299,449	1,940,248	2,239,697
2nd Qtr	283,858	6,589	290,447	2,216,284	2,506,731
3rd Qtr	362,512	18,525	381,037	1,770,586	2,151,623
4th Qtr	322,817	16,935	339,752	1,991,820	2,331,572
1957	1,356,898	59,274	1,416,172	7,098,306	8,514,478
1956	1,668,674	74,912	1,743,586	5,669,833	7,413,419
1955	1,721,243	67,098	1,788,341	4,882,493	6,670,834
1954	1,949,368	45,528	1,994,896	4,988,122	6,983,018
1953	1,529,976	49,763	1,579,739	4,390,576	5,970,315
1952	1,603,833	63,214	1,667,047	3,497,939	5,164,986
1951	1,815,274	33,402	1,848,676	2,819,676	4,668,352
1950	1,307,335	27,192	1,334,527	2,516,247	3,850,774
1949	1,094,924	53,868	1,148,792	2,688,164	3,836,956
1948	1,395,341	61,807	1,457,148	2,488,915	3,946,063
1947	1,153,563	48,492	1,202,055	1,821,580	3,023,635
1946	1,019,118	53,707	1,072,825	852,005	1,924,830
1945	910,049	70,960	981,009	739,581	1,720,590

U. S. Bureau of Mines.

Aluminum Wrought Products

(Producers' shipments, thousands of pounds)

Period	Totals	Plates, Sheets, and Foil	Rolled Structural Shapes, Rods, Bars, Wire	Extruded Shapes, Blooms, and Tubing	Powder, Flake, and Paste: Forgings
1959*	3,450,000	1,900,000	460,000	1,000,000	90,000
Jan.	236,338	122,729	36,110	71,189	6,310
Feb.	231,768	122,747	30,838	72,122	6,061
Mar.	271,642	150,759	32,616	81,276	6,991
Apr.	294,916	156,448	35,969	94,634	7,865
May	320,786	170,224	42,972	99,308	8,282
June	341,389	182,565	43,084	107,125	8,615
July	373,060	195,426	56,309	111,731	9,594
Aug.	247,549	120,457	35,422	85,140	6,530
Sept.	262,749	130,726	35,430	89,786	6,807
1958	2,596,872	1,353,034	345,834	821,671	76,333
Jan.	192,867	100,955	28,509	57,444	5,959
Feb.	178,643	93,432	25,138	54,013	6,060
Mar.	187,023	97,423	25,512	58,051	6,037
Apr.	211,483	112,520	28,254	63,940	6,769
May	218,109	115,660	27,361	68,186	6,902
June	228,579	118,367	28,671	74,973	6,568
July	229,652	118,790	32,128	72,278	6,456
Aug.	213,441	110,008	28,966	67,829	6,638
Sept.	231,194	119,288	29,962	75,269	6,675
Oct.	254,326	130,431	31,991	85,328	6,576
Nov.	216,263	114,491	24,284	71,666	5,822
Dec.	235,292	121,669	35,058	72,694	5,871
1957	2,677,623	1,396,502	399,097	789,573	92,451
1956	2,885,808	1,568,117	421,201	792,403	104,087
1955	2,791,791	1,542,723	367,951	775,092	106,025

U. S. Bureau of the Census. *Estimated

Antimony Imports

(Net tons)

Year	—Antimony Ore— Gross Weight	Sb Content	Needle or Liquidated Sb	Antimony Metal	Type Metal & Antimonial Lead†	Antimony Oxide
1958	12,262	5,185	17	4,672	(n.a.)	1,283
1957	21,374	8,198	38	5,052	(n.a.)	1,893
1956	17,424	6,572	46	4,693	(n.a.)	1,489
1955	16,307	7,514	46	3,671	(n.a.)	2,210
1954	12,870	4,722	33	2,825	4,088	1,476
1953	17,242	7,778	15	2,627	1,350	1,296

U. S. Bureau of Mines. (n.a.)—Not available. †Estimated Sb content.

Antimony Consumption

(Industrial use of primary; net tons)

PRODUCTS	1958	1957	1956	1955
Antimonial Lead & Battery Metal	3,698	3,983	2,907	2,519
Bearing Metal & Bearings	644	944	1,077	831
Cable Covering	208	183	190	146
Castings	82	106	57	67
Collapsible Tubes & Foil	37	20	12	24
Sheets & Pipe	273	258	300	157
Solder	100	90	144	131
Type Metal	877	399	528	598
Other Metal	147	165	151	166
Nonmetal Products	5,814	5,783	7,531	7,833
Totals	11,880	11,931	12,897	12,472

U. S. Bureau of Mines.

Antimony Production

(Domestic mine production of ores and concentrates; net tons)

Year	Gross Weight	—Antimony Content— Quantity	Average Per Cent
1958	4,292	705	16.7
1957	4,192	709	16.9
1956	3,505	590	16.9
1955	3,967	633	16.0
1954	4,685	766	16.4
1953	2,161	372	17.2

U. S. Bureau of Mines.

Magnesium Wrought Products

(Shipments—thousands of pounds)

	1959	1958	1957	1956	1955	1954
Jan.	1,768	1,272	2,130	2,118	1,776	972
Feb.	1,691	1,280	2,522	1,901	1,648	1,058
Mar.	1,717	1,398	2,388	2,351	1,947	1,290
Apr.	2,089	1,479	2,510	2,279	1,756	892
May	1,644	1,443	2,230	2,462	1,836	1,128
June	1,946	1,709	1,881	2,302	1,678	1,312
July	1,680	1,227	1,428	2,002	1,437	1,032
Aug.	2,131	1,822	1,540	2,523	1,742	1,111
Sept.	2,288	1,807	1,501	2,031	2,158	1,183
Oct.	....	1,983	1,453	861	1,666	1,002
Nov.	....	1,660	1,230	2,141	1,954	1,243
Dec.	....	1,622	1,102	2,452	1,576	1,673
Totals	18,702	21,915	25,423	21,174	13,743	

U. S. Bureau of the Census.

Nonferrous Metals

METALWORKING FACTS AND FIGURES

U.S. Silver Output

(Thousands of ounces; commercial bars, 0.999 fine, and other refined forms)

	From Domestic Ores†	From Foreign Ore	Total
1959*	22,000	27,500	49,500
Jan.	2,330	4,460	6,790
Feb.	2,827	2,913	5,740
Mar.	2,823	4,087	6,910
Apr.	2,946	3,233	6,179
May	2,641	3,484	6,125
June	3,219	3,231	6,450
July	2,609	3,284	5,893
Aug.	1,472	1,229	2,701
Sept.	390	577	967
1958	35,691	37,572	73,263
1957	36,279	34,932	71,211
1956	38,157	40,160	78,317
1955	37,500	40,000	77,500
1954	38,059	39,422	77,481
1953	34,697	37,764	72,461
1952	40,245	36,653	76,898
1951	39,967	33,837	73,804
1950	42,068	37,656	79,724
1949	34,559	28,226	62,785
1948	36,111	37,680	73,791
1947	36,053	39,645	75,698
1946	21,377	30,371	51,748

†Includes purchases of crude silver by the U. S. Mint. *Estimated. American Bureau of Metal Statistics.

Magnesium Ingot Production

(Net tons)

	1959	1958	1957	1956
Jan.	1,877	5,272	7,111	6,337
Feb.	1,725	3,526	6,399	5,908
Mar.	1,925	3,235	7,175	6,348
Apr.	1,808	2,772	7,020	6,081
May	2,668	2,469	7,028	6,359
June	2,778	1,784	6,534	6,098
July	2,850	1,799	6,598	1,136
Aug.	2,967	1,845	6,958	3,314
Sept.	2,846	1,791	6,296	6,128
Oct.	...	1,927	6,276	6,735
Nov.	...	1,814	5,823	6,818
Dec.	...	1,862	5,648	7,085
Totals	29,000*	30,096	78,865	68,347

Magnesium Association. *Estimated.

Uranium Concentrate

(Procurement by U. S. Atomic Energy Commission in tons of U_3O_8. Purchases from 1943 through 1947 include those made by Manhattan Engineer District. Periods are fiscal years ended July 1)

	Domestic	Foreign	Total
1959	15,160	18,170	33,330
1958	10,250	16,130	26,380
1957	7,580	8,580	16,160
1956	4,200	6,240	10,440
1955	2,140	3,800	5,940
1954	1,450	3,240	4,690
1953	990	1,910	2,900
1952	830	2,830	3,660
1951	630	3,050	3,680
1950	320	2,740	3,060
1949	120	1,960	2,080
1948	110	1,960	2,070
1943-47	1,440	10,150	11,590

U.S. Tin Consumption

(Gross tons)

	Consumption			
1959	Primary	Secondary	Totals	Stocks
Jan.	4,490	2,370	6,860	24,040
Feb.	4,245	2,540	6,785	25,045
Mar.	4,700	2,810	7,510	24,570
Apr.	4,880	2,875	7,755	24,165
May	4,995	2,460	7,455	22,990
June	4,995	2,940	7,935	24,670
July	3,210	2,390	5,600	33,745
Aug.	2,185	2,575	4,760	32,975
1958	47,998	24,587	72,585	22,640
1957	54,429	28,078	82,507	24,158
1956	60,470	29,854	90,324	24,529
1955	59,828	30,655	90,483	35,362
1954	54,427	28,464	82,891	29,552
1953	53,959	31,681	85,640	51,546
1952	45,323	27,950	73,273	46,625
1951	56,884	31,285	88,169	31,532
1950	71,191	33,273	104,464	63,486
1949	47,163	25,243	72,406	59,813
1948	59,863	30,925	90,789	63,517
1947	59,166	28,934	88,100	68,728

International Tin Study Group; U. S. Bureau of Mines.

Nickel Production

(Net tons)

	Canada	Other Countries†	Estimated Totals
1959*	180,000	53,000	233,000
1958	139,559	49,122	188,681
1957	188,962	70,877	259,839
1956	178,750	52,250	231,000
1955	174,950	40,050	215,000
1954	161,250	30,750	192,000
1953	143,000	27,000	170,000
1952	140,020	23,020	163,580
1951	137,900	46,100	184,000
1950	123,660	38,340	162,000
1949	125,690	32,310	161,000
1948	131,740	34,660	166,400
1947	118,621	35,679	154,300
1946	96,062	42,538	138,600
1945	122,565	37,435	160,000
1944	137,299	35,701	173,000
1943	144,009	40,091	184,100
1942	142,606	31,594	174,200

*Estimated. †Free World. U. S. Bureau of Mines; Dominion Bureau of Statistics; STEEL.

Tungsten Concentrates

(Pounds of contained tungsten. Stocks are those held by consumers and dealers)

	Imports for Consumption		
1959	Consumption	Imports for Consumption	Stocks
Jan.	541,000	277,000	4,770,000
Feb.	873,000	336,000	4,618,000
Mar.	944,000	444,000	4,394,000
Apr.	937,000	1,110,000	4,306,000
May	632,000	615,000	4,105,000
June	904,000	373,000	3,523,000
July	580,000	440,000	3,551,000
1958	5,320,000	6,542,000	4,670,000
1957	8,544,000	14,018,000	4,103,000
1956	9,061,000	20,860,000	2,980,000

U. S. Bureau of Mines.

World Tin

(Gross tons)

1959	Production	Consumption	Stocks
Jan.	12,200	13,600	58,900
Feb.	10,700	13,100	57,500
Mar.	8,500	13,800	55,600
Apr.	8,600	14,300	52,300
May	10,200	14,000	50,700
June	9,500	15,200	52,900
1958	141,000	148,000	58,600
1957	174,000	155,000	59,400
1956	182,000	160,000	44,600
1955	182,000	154,000	45,600
1954	185,000	143,000	43,000
1953	181,000	134,000	54,700
1952	168,500	132,500	54,700
1951	168,000	140,000	59,400
1950	174,000	152,000	73,700

International Tin Study Group. Figures are partly estimated and include substantial revisions from previously reported totals.

Chrome Ore

(Net tons)

1959	Domestic Production	Imports	New Supply	Consumption
8 Mo.	75,066	974,566	1,049,632	963,854
Jan.	9,854	199,848	209,702	118,710
Feb.	9,007	127,597	136,604	112,660
Mar.	9,236	84,286	93,522	138,229
Apr.	8,986	100,560	109,546	144,085
May	9,339	116,433	125,772	131,594
June	9,585	110,122	119,707	131,598
July	10,887	109,399	120,286	108,549
Aug.	8,172	126,321	134,493	80,418
1958	143,795	1,263,437	1,407,232	1,220,749
1957	166,157	2,282,721	2,448,878	1,760,469
1956	207,662	2,175,056	2,382,718	1,846,600
1955	153,253	1,833,999	1,987,252	1,583,983
1954	163,365	1,471,037	1,634,402	913,973

U. S. Bureau of Mines.

Molybdenum Products

(Ferromolybdenum, molybdic oxide, and molybdenum salts and metal, thousands of pounds)

1959	Production	Shipments†	Stocks‡
Jan.	3,337	2,746	8,807
Feb.	3,084	3,438	8,543
Mar.	4,275	4,065	8,954
Apr.	4,132	4,531	8,786
May	3,370	4,064	8,367
June	3,384	3,710	8,300
July	2,669	2,594	8,688
Aug.	2,286	2,281	8,882
1958	30,915	31,359	8,081
1957	37,698	36,865	5,789
1956	41,208	42,820	2,812
1955	37,774	38,606	3,156
1954	24,328	25,357	3,430
1953	30,283	30,701	3,894
1952	32,383	32,054	3,373

†Including exports. ‡Producers'. U. S. Bureau of Mines.

Manganese

(Supplies for U. S. consumption, net tons)

	Domestic Mine	General Imports		Exports		
1959	Shipments	Ore	Ferro-manganese†	Ore	Ferro-manganese†	Net Supply
7 Mo.	160,800	1,455,457	140,628	3,742	2,164	1,751,000
Jan.	24,500	272,101	28,512	482	230	324,000
Feb.	21,500	159,337	12,222	692	488	192,000
Mar.	25,300	156,149	12,936	350	172	194,000
Apr.	17,000	280,087	18,230	591	134	315,000
May	15,500	200,750	26,972	625	292	242,000
June	26,000	211,575	25,864	762	346	262,000
July	31,000	175,458	15,892	240	502	222,000
1958	323,108	2,452,578	170,712	4,882	3,986	2,938,000
1957	366,334	3,105,172	411,446	5,267	16,256	3,861,000
1956	344,735	2,238,568	488,436	6,131	5,984	3,060,000
1955	287,255	2,078,205	242,658	6,279	4,488	2,597,000

†Expressed in terms of ore.

U. S. Bureau of Mines.

Molybdenum Concentrates

(Pounds)

1959	Production	Shipments†	Consumption	Stocks
Jan.	4,994,000	3,702,000	3,505,000	6,683,000
Feb.	4,593,000	4,229,000	3,379,000	7,178,000
Mar.	4,620,000	5,132,000	4,109,000	6,426,000
Apr.	4,598,000	4,773,000	4,095,000	6,288,000
May	4,563,000	4,462,000	3,430,000	6,445,000
June	4,785,000	4,886,000	3,419,000	6,689,000
July	4,226,000	3,517,000	2,690,000	7,639,000
Aug.	3,682,000	3,185,000	2,286,000	8,071,000
1958	41,069,000	42,328,000	31,298,000	5,643,000
1957	60,753,000	57,143,000	38,954,000	7,093,000
1956	57,462,000	57,126,000	42,652,000	2,920,000
1955	61,781,000	64,709,000	38,799,000	2,730,000

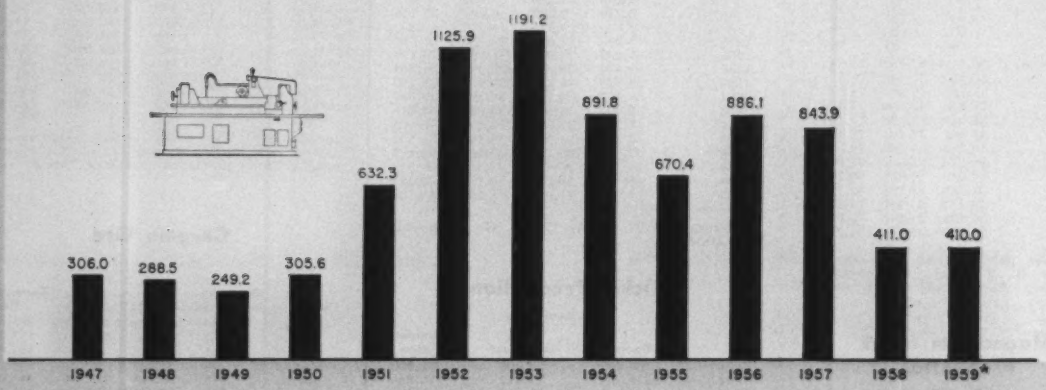
†Including exports, plus concentrates converted to oxide at Miami, Ariz., and Langeloth, Pa.
U. S. Bureau of Mines.

Machine Tools

METALWORKING FACTS AND FIGURES

YEARLY SHIPMENTS

(Millions of dollars)



MACHINE TOOLS—Metal Cutting Types Only

(Net new orders in thousands†)

	1959			1958		
	Domestic	Foreign	Totals	Domestic	Foreign	Totals
Jan.	$24,850	$4,250	$29,100	$15,950	$3,350	$19,300
Feb.	31,050	4,900	35,950	18,550	4,250	22,800
Mar.	36,050	4,200	40,250	23,450	6,000	29,450
Apr.	35,200	5,200	40,400	16,600	6,300	22,900
May	34,800	2,700	37,500	18,450	3,450	21,900
June	49,800	4,100	53,900	18,550	4,500	23,050
July	45,650	5,100	50,750	17,200	3,700	20,900
Aug.	38,750	3,500	42,250	16,550	2,700	19,250
Sept.	39,900	7,800	47,700	18,350	1,750	20,100
Oct.	35,850	7,800	43,650	24,200	4,250	28,450
Nov.	.....	....	.....	18,950	3,300	22,250
Dec.	.....	....	.....	26,100	4,950	31,050
10 Mo. Totals	$371,900	$49,950	$421,450			
Annual Totals				$232,900	$48,500	$281,400

YEARLY TOTALS

	Domestic	Foreign	Totals
1957	$462,150	$57,600	$519,750
1956	828,650	95,350	924,000
1955	846,250	80,850	927,100
1954	458,150	56,300	514,450
1953	692,250	55,800	748,050
1952	748,950	53,600	802,550
1951	1,364,450	163,500	1,527,950
1950	596,500	115,950	712,450
1949	169,600	63,500	233,100
1948	217,950	43,000	260,950

†Gross orders minus cancellations.

(Shipments in thousands)

	1959			1958		
	Domestic	Foreign	Totals	Domestic	Foreign	Totals
Jan.	$20,000	$3,400	$23,400	$42,000	$5,750	$47,750
Feb.	22,000	5,100	27,100	34,400	4,100	38,500
Mar.	32,400	5,450	37,850	41,300	4,550	45,850
Apr.	28,550	4,700	33,250	34,950	5,250	40,200
May	27,500	2,850	30,350	32,650	4,950	37,600
June	33,400	3,750	37,150	30,900	4,550	35,450
July	28,850	2,350	31,200	18,900	4,300	23,200
Aug.	27,000	4,050	31,050	19,300	3,850	23,150
Sept.	33,250	3 000	36,250	23,100	4,100	27,200
Oct.	37,200	3,700	40,900	29,150	3,600	32,750
Nov.	.....	....	.....	21,400	4,050	25,450
Dec.	.....	....	.....	29,250	4,650	33,900
10 Mo. Totals	$290,150	$38,350	$328,500			
Annual Totals				$357,300	$53,700	$411,000

YEARLY TOTALS

	Domestic	Foreign	Totals
1957	$753,350	$90,550	$843,900
1956	804,600	81,550	886,150
1955	600,000	70,400	670,400
1954	813,250	78,500	891,750
1953	1,078,050	113,150	1,191,200
1952	1,003,200	122,700	1,125,900
1951	569,000	63,250	632,250
1950	245,950	59,600	305,550
1949	186,850	62,300	249,150
1948	237,700	50,750	288,450

National Machine Tool Builders' Association. *Estimated.

MACHINE TOOLS—Forming Type) Only

(Value in thousands)

	1959 NET NEW ORDERS			1959 SHIPMENTS			1958 NET NEW ORDERS			1958 SHIPMENTS		
	Domestic	Foreign	Totals	Domestic	Foreign	Totals	Domestic	Foreign	Totals	Domestic	Foreign	Totals
Jan.	$10,250	$1,700	$11,950	$5,800	$2,100	$7,900	$6,050	$1,500	$7,550	$8,800	$1,250	$10,050
Feb.	9,000	450	9,450	7,850	1,100	8,950	5,200	300	5,500	8,750	800	9,550
Mar.	10,650	650	11,300	7,000	900	7,900	6,350	350	6,700	7,200	1,100	8,300
Apr.	11,700	1,100	12,800	9,700	2,050	11,750	4,250	1,150	5,400	9,250	1,450	10,700
May	10,750	450	11,200	8,800	1,850	10,650	5,400	750	6,150	9,050	3,450	12,500
June	10,300	1,200	11,500	11,550	1,350	12,900	5,750	3,300	9,050	8,000	2,050	10,050
July	7,600	5,050	12,650	8,150	1,250	9,400	4,750	900	5,650	5,600	900	6,500
Aug.	8,300	1,650	9,950	8,350	900	9,250	6,650	2,400	9,050	5,650	1,000	6,650
Sept.	10,200	950	11,150	9,000	900	9,900	6,300	1,700	8,000	6,550	1,150	7,700
Oct.	15,700	7,800	23,500	9,550	1,800	11,350	7,800	750	8,550	6,750	1,900	8,650
Nov.	.....	.....	.....	.....	.....	.....	7,900	550	8,450	6,050	2,150	8,200
Dec.	.....	.....	.....	.....	.....	.....	8,650	4,200	12,850	8,550	1,500	10,050
10 Mo. Totals	$104,450	$21,000	$125,450	$85,750	$14,200	$99,950						
1958 Totals							$75,050	$17,850	$ 92,900	$ 90,200	$18,700	$108,900
1957 Totals							$111,550	$11,600	$123,150	$219,550	$25,000	$244,550

National Machine Tool Builders' Association.

METALWORKING MACHINERY—Forming and Shaping Types

(Value of shipments in thousands)

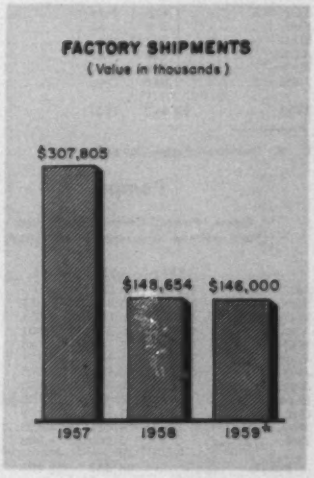
	Bending, Forming Machines	Hydraulic, Pneumatic Presses	Mechanical-Power Driven Presses	Manual Presses	Punching, Shearing Machines	Forging Machines, Hammers	Wire, Met. Ribbon Form. Machines	Riveting Machines	Misc. Forming, Cutting Machines
1959 1st Qtr	$5,418	$4,970	$8,851	$146	$6,306	$3,205	$617	$796	$1,104
1958	23,299	30,729	36,733	553	27,068	20,110	2,209	3,030	4,923
1957	33,245	85,451	135,097	437	26,479	10,830	2,694	3,005	10,567
1956	30,174	25,045	195,243	664	25,776	10,814	2,932	3,916	9,918
1955	23,518	33,116	108,853	320	18,333	9,583	3,011	3,106	7,194

(Value of new orders in thousands)

1959 1st Qtr	$7,475	$8,716	$13,828	$105	$6,867	$4,198	$778	$1,156	$1,411
1958	26,758	18,596	37,372	438	20,150	10,514	2,159	3,350	5,641
1957	25,719	26,294	50,207	294	20,948	6,083	1,776	2,348	6,605
1956	25,545	39,509	117,618	542	23,520	12,290	2,680	2,598	10,182
1955	28,489	27,967	268,712	637	22,730	12,235	4,094	3,188	10,055

U. S. Bureau of the Census.

*Estimated.



PRODUCERS' SHIPMENTS OF MACHINE TOOLS (Value in thousands)

	Boring Machines	Broaching Machines	Drilling Machines	Gear Cutting, Finishing Machines	Grinding, Polishing Machines	Lathes	Milling Machines	Planers	Shapers (except gear shapers)	All Others	Totals
1958	$51,563	$4,377	$28,264	$21,850	$87,353	$94,909	$89,315	$3,607	$2,306	$71,036	$454,580
1957	101,976	16,332	56,272	38,944	160,098	199,752	154,973	8,189	4,194	137,617	878,347
1956	101,838	20,309	65,370	49,380	172,803	217,054	115,817	6,445	4,864	137,932	891,812
1955	77,372	14,457	53,805	36,565	123,899	153,285	89,573	7,511	4,646	104,678	665,791
1954	114,443	17,253	86,066	48,111	154,288	206,886	122,518	10,978	5,692	124,528	890,763

U. S. Bureau of the Census.

Industrial Trucks and Tractors

(Units shipped)

ELECTRIC TRUCKS (Rider type)

	1959	1958	1957	1956	1955
Jan.	270	383	480	409	342
Feb.	206	370	385	491	359
Mar.	266	394	411	503	425
Apr.	295	373	455	503	406
May	292	325	429	520	833
June	384	277	433	533	533
July	400	353	420	512	455
Aug.	273	211	242	374	346
Sept.	386	294	302	442	441
Oct.	...	295	373	491	449
Nov.	...	238	366	501	441
Dec.	...	385	389	442	520
Totals	...	3,898	4,685	5,721	5,550

YEARLY TOTALS

1954	4,947	1952	7,409
1953	8,992	1951	6,525

HAND TRUCKS (Motorized)

1959			
Jan.	361	July	579
Feb.	282	Aug.	355
Mar.	426	Sept.	433
Apr.	440	Oct.	...
May	361	Nov.	...
June	574	Dec.	...
1958	5,062	1957	6,581

GASOLINE POWERED TRUCKS AND TRACTORS

1959			
Jan.	1,472	July	1,916
Feb.	1,429	Aug.	2,161
Mar.	1,897	Sept.	2,226
Apr.	2,155	Oct.	....
May	1,760	Nov.	....
June	2,040	Dec.	....
1958	15,242	1957	21,110

U. S. Bureau of the Census.

Pumps

Steam, Power, Centrifugal, Rotary
(New orders—thousands of dollars)

	1959	1958	1957	1956
Jan.	4,972	5,261	9,601	8,094
Feb.	5,460	5,918	7,551	7,735
Mar.	5,572	6,004	7,654	8,987
Apr.	6,702	5,313	7,801	8,865
May	7,049	6,728	7,786	9,903
June	7,258	5,467	8,228	8,240
July	5,700	5,088	7,143	7,587
Aug.	....	5,663	6,982	8,336
Sept.	....	5,864	6,177	8,436
Oct.	....	5,411	6,158	9,188
Nov.	....	4,414	5,838	8,522
Dec.	....	5,200	4,906	6,838
Totals	....	66,331	85,825	100,731

U. S. Bureau of the Census.

Industrial Control Apparatus

(Sales)

1959			
9 Mo.	$172,157,108	1955	$194,165,278
1958	230,716,620	1954	179,253,471
1957	285,345,548	1953	205,357,230
1956	273,690,705	1952	208,908,893

National Electrical Manufacturers Association.

Central Air Conditioning

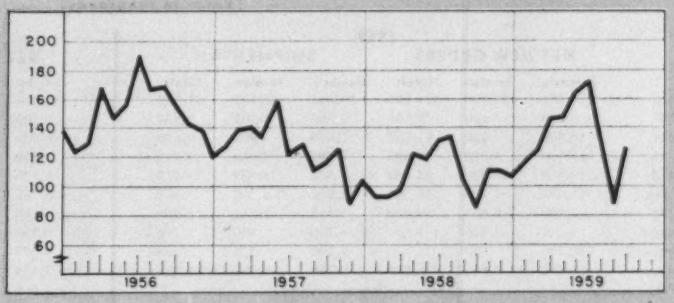
(Value of systems installed)

1958	$550,730,000	1954	$378,810,000
1957	598,900,000	1953	295,040,000
1956	528,180,000	1952	252,920,000
1955	434,120,000	1951	278,200,000

Air-Conditioning & Refrigeration Institute.

MATERIAL HANDLING EQUIPMENT

(Bookings index—1954=100)



	1959	1958	1957	1956	1955	1954
Jan.	115.84	93.07	126.34	122.48	91.69	93.56
Feb.	124.77	93.49	139.29	129.56	98.71	96.45
Mar.	146.36	97.89	140.76	166.14	149.16	115.55
Apr.	147.28	122.36	132.67	145.20	109.52	122.76
May	164.45	118.04	157.95	155.53	115.61	98.54
June	170.72	131.15	121.57	189.13	139.88	112.42
July	130.26	134.34	128.31	165.05	111.76	91.68
Aug.	87.02	104.46	110.09	168.70	106.24	94.06
Sept.	126.43	85.41	116.79	152.51	136.08	88.43
Oct.	.....	111.35	124.80	143.38	123.52	95.41
Nov.	.....	110.88	87.80	138.50	118.09	88.66
Dec.	.....	105.97	105.65	117.76	139.83	102.49

YEARLY AVERAGES

1959 (9 Mo.)	134.79	1956	149.50
1958	109.03	1955	120.01
1957	124.34	1954	100.00

Material Handling Institute Inc.

Air Conditioning, Commercial Refrigeration Equipment

(Factory shipments—number of units and value in thousands of dollars)

	CONDENSING UNITS		COMPRESSORS, COMPRESSOR UNITS		ICEMAKING MACHINES	
	Number	Value	Number	Value	Number	Value
1958	530,419	62,104	2,959,157	139,909	31,118	17,913
1957	554,133	69,143	3,179,910	149,203	30,596	17,364
1956	616,823	80,414	3,785,395	166,718	31,416	18,112
1955	589,335	71,067	2,554,031	116,917	31,521	16,369
1954	570,418	63,699	n.a.	127,076	n.a.	11,960
1953	966,136	74,013	2,380,739	121,054	28,228	14,385
1952	654,223	61,439	1,677,300	71,047	26,693	12,838

	CENTRIFUGAL REFRIGERATION SYSTEMS		HEAT EXCHANGER EQUIPMENT		PACKAGED AIR CONDITIONING EQUIPMENT	
	Number	Value	Number	Value	Number	Value
1958	1,090	32,043	.....	121,733	1,903,836	431,685
1957	1,107	34,077	.....	130,707	1,803,136	447,632
1956	921	29,105	.....	143,088	2,082,768	494,998
1955	818	25,732	.....	114,064	1,480,095	369,862
1954	556	19,868	.....	107,923	1,496,113	371,742
1953	469	14,970	.....	82,602	1,137,293	293,644
1952	363	14,040	.....	63,666	438,464	135,579

U. S. Bureau of the Census.

n.a.=not available.

Air Handling Equipment

(Shipments—thousands of dollars)

	Blowers and Fans		Air Washers		Unit Heaters	
Qtrs	1959	1958	1959	1958	1959	1958
1st	32,767	34,424	604	536	19,302	20,190
2nd	38,995	37,901	560	691	20,156	18,197
3rd	.....	31,818	...	460	.....	21,309
4th	.....	32,558	...	681	.....	23,084
Totals	.....	136,701	...	2,368	.....	82,780

U. S. Bureau of the Census.

Machinery & Equipment

METALWORKING FACTS AND FIGURES

Industrial Supplies and Machinery

(Seasonally adjusted new order index—July, 1948=100)

	1959	1958	1957	1956	1955	1954
January	186	163	221	190	160	141
February	202	157	219	190	166	138
March	221	149	210	190	171	133
April	218	148	204	195	172	130
May	218	152	199	199	177	127
June	212	164	199	197	189	132
July	216	170	197	203	182	132
August	212	172	197	211	186	136
September	207	178	203	203	196	143
October	204	187	192	206	195	141
November	...	189	180	220	194	144
December	...	190	167	218	191	152
Mo. Avg	...	168	199	202	182	137

American Supply & Machinery Manufacturers' Association Inc.

Gears

(Index—1947-49=100)

BOOKINGS

	1959	1958	1957	1956
Jan.	218.6	175.4	259.3	245.5
Feb.	199.9	179.1	239.5	256.2
Mar.	234.3	173.7	262.4	276.5
Apr.	255.6	153.2	221.7	264.7
May.	241.0	142.2	263.2	275.6
June	274.2	173.8	215.9	245.4
July	262.8	133.3	211.4	286.7
Aug.	213.3	162.1	225.8	219.5
Sept.	243.9	170.7	174.9	230.5
Oct.	230.5	175.9	207.3	299.8
Nov.	....	182.7	165.3	216.2
Dec.	....	145.5	150.8	235.7

Yearly Averages

1958	164.0	1952	164.3
1957	216.5	1951	221.4
1956	254.4	1950	94.3
1955	199.2	1949	80.3
1954	151.9	1948	115.5
1953	165.8	1947	104.2

SHIPMENTS

	1959	1958	1957	1956
Jan.	187.7	197.4	270.4	190.1
Feb.	201.5	186.9	264.2	185.2
Mar.	222.7	200.1	269.3	216.9
Apr.	231.8	197.9	270.5	237.2
May	223.9	141.9	232.0	242.8
June	239.7	180.8	249.2	240.3
July	199.8	149.3	219.6	255.7
Aug.	204.3	161.7	219.3	257.3
Sept.	216.1	156.2	237.3	257.5
Oct.	224.1	174.3	247.8	281.6
Nov.	....	140.4	212.5	254.9
Dec.	....	167.6	200.0	229.6

Yearly Averages

1958	171.2	1952	164.3
1957	241.0	1951	158.2
1956	234.9	1950	101.2
1955	164.6	1949	89.3
1954	165.2	1948	110.9
1953	201.5	1947	99.8

American Gear Manufacturers Association.

Screw Machine Products

(Index—1946-49=100)

SHIPMENTS

	1959	1958	1957	1956	1955
Jan.	193	165	206	216	173
Feb.	193	145	185	214	174
Mar.	214	141	197	215	199
Apr.	219	141	193	199	204
May	201	134	192	191	201
June	218	133	173	178	212
July	194	124	139	137	144
Aug.	205	142	173	172	187
Sept.	216	151	168	164	190
Oct.	228	184	184	202	201
Nov.	...	158	159	180	198
Dec.	...	175	144	167	195

Yearly Averages

1958	149	1955	190
1957	176	1954	150
1956	186	1953	228

NEW ORDERS

	1959	1958	1957	1956	1955
Jan.	215	138	211	208	186
Feb.	236	137	181	207	191
Mar.	260	122	185	224	239
Apr.	234	108	183	184	198
May	219	139	167	165	201
June	239	142	166	154	191
July	192	138	159	142	183
Aug.	194	154	147	170	220
Sept.	233	161	181	143	208
Oct.	214	203	184	213	216
Nov.	...	176	135	175	200
Dec.	...	179	110	167	203

Yearly Averages

1958	150	1955	203
1957	167	1954	139
1956	179	1953	188

National Screw Machine Products Association.

Foundry Equipment Sales

(Index of net orders closed for new equipment 1947-49=100)

	1959	1958	1957	1956
Jan.	127.4	57.9	117.9	195.6
Feb.	237.1	57.6	188.4	169.0
Mar.	166.6	85.9	127.0	152.7
Apr.	154.2	88.7	101.1	135.2
May	157.0	136.1	136.2	207.0
June	125.1	87.7	187.5	156.7
July	110.7	77.9	98.6	110.3
Aug.	134.1	74.1	231.3	188.3
Sept.	131.3	64.5	113.9	114.7
Oct.	140.8	118.9	145.3	122.2
Nov.	....	83.3	59.6	121.0
Dec.	....	137.0	61.4	115.6
Mo. Avg	....	89.1	130.7	149.0

Foundry Equipment Manufacturers Association.

Typewriters

(Factory shipments)

	1959 Units	1959 Value (000)	1958 Units	1958 Value (000)
Jan.	97,346	$13,921	81,088	$10,911
Feb.	84,642	13,423	64,777	9,564
Mar.	92,956	14,743	88,566	11,526
Apr.	94,802	15,432	92,267	12,734
May	89,901	14,773	84,127	12,875
June	114,005	17,658	85,454	13,224
July	109,593	15,420	102,556	12,928
Aug.	114,052	16,769	125,833	15,748
Sept.	108,539	16,493	139,562	16,888
Oct.	.....	.....	144,524	17,298
Nov.	.....	.....	114,524	13,689
Dec.	.....	.....	109,730	13,540

YEARLY TOTALS

1958.	1,233,313	$160,925	
1957.	1,645,289	199,377	
1956.	1,500,704	$182,859	
1955.	1,258,466	148,008	

U. S. Bureau of the Census.

Motors and Generators

(New orders—thousands of dollars)

Polyphase Induction Motors, 1-200 hp

Qtrs	1959	1958	1957
1st	41,089	33,187	49,467
2nd	47,367	37,077	49,188
3rd	39,627	36,988	44,640
4th	.....	36,637	39,178
Totals	.....	143,889	182,473

DC Generators & Motors, 1-200 hp

Qtrs	1959	1958	1957
1st	8,270	4,096	14,947
2nd	7,781	5,420	8,317
3rd	7,222	5,339	8,625
4th	....	5,656	6,441
Totals	....	20,511	38,330

YEARLY TOTALS

	Polyphase Induction Motors, 1-200 hp		DC Generators & Motors, 1-200 hp
1956	222,035	1956	47,507
1955	180,328	1955	40,210
1954	139,949	1954	32,376
1953	165,875	1953	32,133
1952	152,801	1952	40,483
1951	209,861	1951	43,318
1950	155,308	1950	28,874
1949	76,063	1949	16,900

National Electrical Manufacturers Assn.

Heat Treating

(Billings—thousands of dollars)

	1959	1958	1957
Jan.	2,915.5	2,825.5	3,533.9
Feb.	2,976.0	2,466.3	3,378.9
Mar.	3,397.3	2,490.5	3,361.8
Apr.	3 420.6	2,538.0	3,572.4
May	3,405.6	2,421.5	3,389.6
June	3,518.5	2,367.3	2,989.4
July	3,259.7	2,141.5	2,814.6
Aug.	3,111.3	2,212.9	2,874.1
Sept.	3,285.7	2,457.1	2,765.0
Oct.	3,509.8	2,754.3	3,076.2
Nov.	.....	2,422.0	2,677.2
Dec.	.....	2,799.4	2,579.3

Metal Treating Institute.

Office Machines

(Value, f.o.b. plant)

	Computing, Accounting Machines	Duplicating Machines	Other
1958	$616,104,000	$28,038,000	$130,090,000
1957	605,896,000	27,362,000	137,180,000
1956	533,499,000	27,079,000	138,404,000
1955	431,577,000	22,288,000	115,514,000

U. S. Bureau of the Census.

Machinery & Equipment

METALWORKING FACTS AND FIGURES

Construction Machinery

(Total manufacturers' shipments†)

(Value in thousands of dollars)

1959		1958	1,377,542
1st Qtr	248,448	1957	1,601,426
2nd Qtr	339,228	1956	970,142
3rd Qtr	.....	1955	726,218
4th Qtr	.....	1954	543,352

Ditchers, Trenchers, Scrapers, Rollers, and Compactors

	Units	Value		Units	Value
1959			1958	....	86,684
1st Qtr	....	22,138	1957	....	99,516
2nd Qtr	....	40,252			
3rd Qtr	....	.....			
4th Qtr	....	.....			

Power Cranes, Draglines, and Shovels

	Units	Value		Units	Value
1959			1958	6,600	215,690
1st Qtr	....	.....	1957	8,543	312,032
2nd Qtr	....	.....	1956	10,511	329,218
3rd Qtr	....	.....	1955	9,860	250,571
4th Qtr	....	.....	1954	7,526	171,404

Motor Graders and Light Maintainers

	Units	Value		Units	Value
1959			1958	6,852	82,016
1st Qtr	1,772	22,711	1957	8,313	92,802
2nd Qtr	2,273	30,115	1956	9,613	101,929
3rd Qtr	....	.....	1955	8,493	76,734
4th Qtr	....	.....	1954	7,236	64,493

Tracklaying Crawler Tractors†

	Units	Value		Units	Value
1959			1958	28,445	266,542
1st Qtr	7,553	71,836	1957	32,863	306,126
2nd Qtr	10,906	74,137	1956	55,417	471,384
3rd Qtr	....	.....	1955	48,891	359,443
4th Qtr	....	.....	1954	40,374	267,918

Tractor Shovel Loaders (Integral units only)

	Units	Value		Units	Value
1959			1958	14,702	161,468
1st Qtr	5,102	49,576	1957	16,539	165,815
2nd Qtr	7,191	70,150			
3rd Qtr	....	.....			
4th Qtr	....	.....			

Contractors' Wheel Tractors‡ (Off-Highway type)

	Units	Value		Units	Value
1959			1958	n.a.	120,840
1st Qtr	1,525	35,282	1957	n.a.	147,162
2nd Qtr	892	20,543	1956	n.a.	136,216
3rd Qtr	....	.....	1955	4,144	64,173
4th Qtr	....	.....	1954	3,019	46,801

Off-Highway Equipment‡ (Truck Type Wheel Tractors, Haulers, Trailers, Wagons)

	Units	Value		Units	Value
1959			1958	....	44,229
1st Qtr	....	14,853	1957	....	75,073
2nd Qtr	....	21,310	1956	....	86,932
3rd Qtr	....	.....	1955	....	46,527
4th Qtr	....	.....	1954	....	25,126

Construction Machinery for Mounting on Tractors†

	Units	Value		Units	Value
1959			1958	....	87,526
1st Qtr	....	24,944	1957	....	88,207
2nd Qtr	....	n.a.	1956	....	114,753
3rd Qtr	....	.....	1955	....	94,454
4th Qtr	....	.....	1954	....	73,877

Mixers, Pavers, and Related Equipment

	Units	Value		Units	Value
1959			1958	....	81,277
1st Qtr	....	14,152	1957	....	79,785
2nd Qtr	....	.....			
3rd Qtr	....	.....			
4th Qtr	....	.....			

Crushing, Screening, Washing, and Combination Plants (Portable)

	Units	Value		Units	Value
1959			1958	1,201	29,129
1st Qtr	246	7,695	1957	1,102	26,356
2nd Qtr	274	10,243			
3rd Qtr	....	.....			
4th Qtr	....	.....			

n.a. = not available.
†Data prior to 1957 not exactly comparable because of changes in reporting and expansion in products covered.
‡Data prior to 1956 not exactly comparable because of changes in reporting and expansion in products covered.
U. S. Bureau of the Census.

Rigid Steel Conduit and Fittings

(Shipments—thousands of feet)

	1959	1958	1957
January	34,764	34,510	32,913
February	26,789	24,773	33,884
March	25,856	26,053	40,916
April	31,654	27,549	25,303
May	35,037	30,762	30,410
June	46,100	41,033	45,257
July	39,126	32,941	54,636
August	29,926	36,383	36,657
September	20,192	40,987	32,492
October	.....	34,318	35,044
November	.....	30,196	28,921
December	.....	27,468	24,889
Totals	....	386,973	421,122

National Electrical Manufacturers Association.

Industrial Furnaces†

(Net new orders)

	1959	1958	1957
Jan.	$3,518,697	$3,047,320	$8,775,162
Feb.	2,741,432	3,683,947	9,768,578
Mar.	6,145,681	2,870,869	10,485,477
Apr.	13,328,453	3,571,968	4,559,380
May	4,174,165	953,523	5,389,450
June	7,029,269	3,671,598	4,369,360
July	13,141,000	5,168,993	4,331,781
Aug.	9,738,000	3,532,619	3,924,212
Sept.	5,560,000	4,846,436	7,463,059
Oct.	12,967,000	3,104,677	3,673,810
Nov.	.....	5,596,808	2,831,786
Dec.	.....	4,284,225	3,991,669
Totals	.....	$44,332,983	$69,563,724

†Other than induction heating units.
Industrial Heating Equipment Association Inc.

Induction Heating Equipment

(Net new orders)

	1959	1958	1957
Jan.	$1,004,871	$629,989	$ 744,454
Feb.	1,147,171	373,604	1,027,331
Mar.	731,449	374,683	784,019
Apr.	1,268,274	434,604	606,654
May	1,127,507	501,172	927,083
June	2,137,210	602,656	715,409
July	1,911,000	502,764	1,325,272
Aug.	1,283,000	382,586	727,821
Sept.	1,374,000	888,167	470,105
Oct.	954,000	743,152	376,371
Nov.	.....	585,649	741,399
Dec.	.....	623,445	519,016
Totals	.....	$6,642,471	$8,964,934

Industrial Heating Equipment Association Inc.

Steel Power Boilers

(New orders, 100 sq ft or more of heating surface)

	Stationary	Marine	Totals
1958	5,532	61	5,593
1957	n.a.	n.a.	6,765
1956	6,949	223	7,172
1955	6,310	97	6,407
1954	n.a.	n.a.	5,496
1953	5,658	35	5,693
1952	5,556	259	5,815
1951	7,171	281	7,452
1950	7,827	169	7,996

Steam Generating Capacity of Water Tube Boilers

(Thousands of pounds of steam per hour at maximum continuous rating)

	Totals	Stationary	Marine
1958	66,697	62,118	4,579
1957	141,644	n.a.	n.a.
1956	247,035	226,840	20,195
1955	164,120	157,295	6,825
1954	90,669	n.a.	n.a.
1953	82,263	80,634	1,629
1952	129,474	121,374	8,100
1951	209,088	194,082	15,006
1950	187,514	184,831	2,683

n.a. = not available.
U. S. Bureau of the Census.

Bearings and Parts

(Value of imports)

1959	Ball Bearings	Roller Bearings
9 Mo.	$3,272,000	$2,508,000
1958	1,528,596	858,916
1957	1,174,000	1,622,000
1956	1,056,664	915,555
1955†	2,346,333	926,816
1954†	576,383	463,077
1953	1,090,100	1,307,201
1952	1,453,539	1,289,746
1951	1,541,301	1,244,019
1950	156,496	117,673
1949	47,979	38,955

†Does not include shipments valued at less than $250.
Foreign Trade Division, U. S. Bureau of the Census.

Resistance Welding Equipment

	1959 Factory Shipments (000)	1959 Net New Orders (000)	1958 Factory Shipments (000)	1958 Net New Orders (000)
Jan.	$1,426.7	$2,396.0	$1,421.7	$1,642.7
Feb.	1,889.5	2,457.4	1,615.1	1,682.5
Mar.	2,178.5	2,811.2	1,658.6	2,550.1
Apr.	2,192.6	2,258.2	1,963.1	1,683.9
May	2,018.9	2,407.1	1,749.9	1,120.6
June	2,702.2	2,597.2	2,345.9	2,113.0
July	2,268.5	1,980.5	2,341.5	1,534.1
Aug.	2,927.7	2,322.3	1,419.4	1,430.6
Sept.	2,112.5	2,434.6	1,124.6	1,060.4
Oct.	2,097.5	2,599.0	1,559.0	2,885.3
Nov.	.....	.....	1,102.3	1,409.4
Dec.	.....	.....	1,357.1	1,553.6

ANNUAL SHIPMENTS

1958	$19,658.2	1956	$48,340.6
1957	20,666.2	1955	30,965.1

Resistance Welder Manufacturers' Association.

Used Machine Tool Sales

(Index—1947-49=100)

	1959	1958	1957
January	109.5	121.1	n.a.
February	148.1	121.9	n.a.
March	139.3	106.3	n.a.
April	132.9	105.0	152.1
May	145.7	99.5	132.6
June	131.3	111.9	137.0
July	135.3	115.0	125.3
August	139.7	93.4	115.6
September	147.8	113.6	117.0
October	....	128.8	108.9
November	....	122.3	104.5
December	....	135.2	87.7

YEARLY AVERAGES

1958	114.5	1955	115.1
1957	128.9	1954	99.5
1956	137.9	1953	130.1

n.a.=not available.
Machinery Dealers National Association.

Contract Stamping Shipments

(1947-49=100)

1959

Jan.	144	May	167	Sept.	...	...
Feb.	153	June	153	Oct.	...	...
Mar.	162	July	124	Nov.	...	...
Apr.	173	Aug.	...	Dec.	...	...

1958

Jan.	131	May	121	Sept.		134
Feb.	128	June	120	Oct.		141
Mar.	132	July	113	Nov.		127
Apr.	130	Aug.	112	Dec.		149

YEARLY AVERAGES

1959 (7 Mo.)	154	1958	128

Pressed Metal Institute.

WELDING ELECTRODES

(Shipments in pounds)

	Mild Steel	Alloy	Nonferrous	Totals
1959 9 Mo.	388,078,706	46,132,300	1,901,933	436,112,939
1958	341,620,461	43,808,308	1,153,927	386,582,696
1957	440,543,476	48,391,390	1,736,485	490,671,351
1956	471,091,044	85,997,814	2,259,929	559,348,787
1955	409,203,615	71,797,359	1,638,701	482,639,675
1954	324,260,613	52,781,433	1,340,081	378,382,127
1953	409,437,791	76,049,553	1,889,653	487,376,997
1952	425,290,499	82,633,922	1,519,208	509,443,629
1951	413,444,913	65,903,970	1,361,836	480,710,719
1950	322,954,832	42,574,710	1,861,686	367,391,228
1949	273,463,740	24,753,807	1,715,362	299,932,909
1948	369,019,831	30,214,928	2,124,496	401,359,255
1947	307,756,495	25,172,382	2,149,768	335,078,645
1946	284,126,356	24,991,208†	.....	309,117,564

†Includes both alloy and nonferrous electrodes.
National Electrical Manufacturers Association.

ARCWELDING SETS

(Units ordered, excluding exports)

	Single Operator, Variable Voltage, DC Sets: Motor Drive	Single Operator, Variable Voltage, DC Sets: Engine Drive	Single Operator, Variable Voltage, DC Sets: Generators Only	Transformer Welders: Industrial Type	Transformer Welders: Limited Input Type
1959 9 Mo.	11,495	6,638	173	9,153	26,330
1958	12,020	7,721	202	7,813	24,101
1957	19,981	9,995	207	11,368	15,161
1956	21,955	11,054	189	15,970	13,853
1955	17,102	9,160	260	13,965	14,041
1954	12,817	7,450	340	12,220	10,310
1953	16,362	9,673	435	13,009	10,595
1952	18,932†	11,104	227	16,794	18,489
1951	13,048†	10,333	485	15,645	16,954
1950	10,115†	8,207	272	9,652	16,674
1949	7,393†	6,193	256	7,295	12,647
1948	10,927†	10,435	385	8,792	13,690
1947	13,677†	10,882	1,169	9,719	13,034
1946	16,467†	10,622	2,818	21,093	16,949

†Does not include rectifier type.
National Electrical Manufacturers Association.

INTERNAL COMBUSTION ENGINES

(Factory shipments)

Gasoline Engines (Except automotive, aircraft, and miniature)

	Total Engines Produced	No. Used in Own Product	Shipped to Other Firms: Number of Engines	Shipped to Other Firms: Value (Thousands)
1958	5,755,879	548,958	5,124,994	$204,830
1957	4,923,718	787,400	4,136,318	208,639
1956	5,883,349	833,008	5,050,341	233,735
1955	4,932,259	914,411	4,017,848	216,130
1954	3,669,505	675,930	2,993,575	179,323
1953	2,989,175	783,211	2,205,964	171,289

Diesel Engines (Except automotive)

	Total Engines Produced	No. Used in Own Product	Shipped to Other Firms: Number of Engines	Shipped to Other Firms: Value (Thousands)
1958	131,869	54,879	44,424	$173,843
1957	126,961	68,828	58,133	241,310
1956	140,814	84,352	56,462	214,830
1955	139,231	78,453	60,778	191,612
1954	104,686	56,047	48,639	172,271
1953	117,628	59,075	58,553	232,488

Gas Engines (Except automotive, aircraft, outboard, and miniature)

	Total Engines Produced	No. Used in Own Product	Shipped to Other Firms: Number of Engines	Shipped to Other Firms: Value (Thousands)
1958	14,931	9,412	5,519	$31,549
1957	20,882	13,475	7,407	55,561
1956	20,472	11,183	9,289	47,196
1955	18,038	10,138	7,900	34,179
1954	10,691	4,501	6,190	25,993
1953	9,615	6,482	3,133	37,615

Outboard Motors

	Number	Value (Thousands)		Number	Value (Thousands)
1957	549,976	$138,823	1953	467,584	$67,489
1956	641,527	150,388	1952	337,419	46,129
1955	514,[illegible]	101,553	1951	291,697	39,456
1954	47[illegible]	76,039	1950	367,173	41,037

U. S. Bureau of the Census.

Appliances

METALWORKING FACTS AND FIGURES

Floor and Wall Furnaces†

(Factory shipments)

	1959 Number of Units	1959 Value, Thousands of Dollars	1958 Number of Units	1958 Value, Thousands of Dollars
Jan.	40,654	2,779	31,674	1,995
Feb.	41,833	2,658	29,484	1,800
Mar.	37,981	2,597	30,387	1,938
Apr.	42,378	2,886	30,794	2,018
May	40,329	2,620	27,782	1,708
June	43,147	2,913	32,322	2,056
July	46,170	3,135	39,023	2,440
Aug.	53,553	3,610	43,083	2,778
Sept.	62,461	4,724	56,508	3,839
Oct.	.....	....	72,551	4,978
Nov.	.....	....	46,129	2,963
Dec.	.....	....	44,815	2,756
Totals	.....	....	484,552	31,269

YEARLY TOTALS

	Number of Units	Value, Thousands of Dollars
1957	469,071	31,878
1956	491,930	34,895
1955	614,584	39,121

†Data for 1959 not exactly comparable with previous data.
U. S. Bureau of the Census.

Oil Burners†

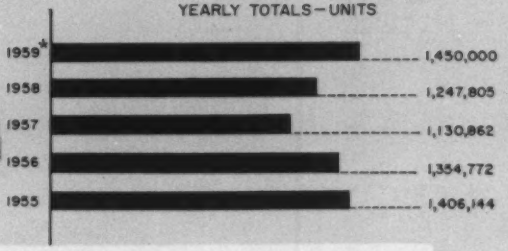
(Units sold separately)

	Residential	Commercial, Industrial	Totals
1959			
Jan.	33,112	2,113	35,225
Feb.	30,058	2,527	32,585
Mar.	28,849	2,213	31,062
Apr.	28,534	2,925	31,459
May	31,437	2,807	34,244
June	47,576	3,278	50,854
July	34,326	2,814	37,140
Aug.	42,126	3,538	45,664
Sept.	50,810	3,936	54,746
Oct.	.....	....	.....
Nov.	.....	....	.....
Dec.	.....	....	.....
YEARLY TOTALS			
1958	381,990	32,262	414,252
1957	424,685	39,470	464,155
1956	531,990	39,115	571,105
1955	609,639	40,602	650,241

†Data for 1959 not exactly comparable with previous data.
U. S. Bureau of the Census.

WARM AIR FURNACES†

(Cast iron and steel)



SHIPMENTS

	1959 Number of Units	1959 Value, Thousands of Dollars	1958 Number of Units	1958 Value, Thousands of Dollars
Jan.	89,053	15,930	74,738	13,941
Feb.	86,317	15,196	71,838	12,745
Mar.	95,005	16,848	76,587	13,642
Apr.	97,608	16,750	75,825	13,566
May	100,581	17,528	84,015	14,945
June	119,346	21,257	103,855	18,417
July	126,456	22,202	99,060	17,625
Aug.	151,160	26,930	130,794	23,796
Sept.	170,742	31,457	161,411	29,966
Oct.	.....	.....	153,065	27,832
Nov.	.....	.....	120,815	21,959
Dec.	.....	.....	95,802	17,292
Totals	1,450,000*	.....	1,247,805	225,726

Yearly Totals	Number of Units	Value, in Dollars
1957	1,130,862	214,454,000
1956	1,354,772	260,644,000
1955	1,406,144	263,865,000
1954	1,151,846	222,500,000
1953	996,603	197,275,000
1952	927,699	187,987,000

†Data for 1959 not exactly comparable with previous data.
U. S. Bureau of the Census. *Estimated.

Domestic Heating Stoves†

(Shipments in number of units)

	Gas	Coal, Wood‡	Kerosine, Fuel Oil	Totals
1959				
Jan.	52,705	9,762	37,049	99,516
Feb.	55,545	9,499	35,652	100,696
Mar.	73,051	12,689	46,326	132,066
Apr.	75,837	18,562	36,144	130,543
May	63,375	20,915	37,821	122,111
June	126,616	27,266	46,854	200,736
July	145,983	32,516	54,033	232,532
Aug.	196,510	42,240	65,045	303,795
Sept.	225,458	55,503	63,532	344,493
Oct.	.....	.....	.....	.....
Nov.	.....	.....	.....	.....
Dec.	.....	.....	.....	.....
1958*				
Jan.	50,891	6,592	20,760	78,243
Feb.	57,745	7,364	32,693	97,802
Mar.	72,941	11,999	33,597	118,537
Apr.	64,349	11,632	27,192	103,173
May	66,965	12,375	21,301	100,641
June	103,526	17,334	29,419	150,279
July	138,174	24,720	46,433	209,327
Aug.	184,445	35,013	52,715	272,173
Sept.	229,180	58,129	57,637	344,946
Oct.	255,481	61,183	62,902	379,566
Nov.	148,728	29,482	30,027	208,237
Dec.	95,053	16,430	25,593	137,076
YEARLY TOTALS				
1958*	1,467,478	310,518	490,250	2,268,246
1957	1,439,783	274,038	521,262	2,235,083
1956	1,698,978	326,805	659,572	2,685,355

†Data for 1959 not exactly comparable with previous data.
‡Excludes sheet metal, airtight type wood stoves.
*Monthly figures may not add up to yearly totals because of yearend revisions.
U. S. Bureau of the Census.

Forced Air Furnaces†

(Shipments in number of units)

	Gas	Oil	Solid Fuel	Totals
1959				
Jan.	62,212	22,671	563	85,446
Feb.	61,503	20,863	625	82,991
Mar.	68,185	22,815	544	91,544
Apr.	72,418	21,011	479	93,908
May	73,530	23,053	540	97,123
June	87,656	26,742	942	115,340
July	92,457	28,050	1,266	121,773
Aug.	108,217	35,187	1,882	145,286
Sept.	117,509	43,533	2,436	163,478
Oct.	.....	.....	....	.....
Nov.	.....	.....	....	.....
Dec.	.....	.....	....	.....
1958*				
Jan.	46,209	20,979	521	67,709
Feb.	45,287	19,500	466	65,253
Mar.	50,243	18,721	442	69,406
Apr.	49,075	19,175	498	68,748
May	54,591	21,655	401	76,647
June	67,455	25,823	698	93,976
July	62,594	25,669	956	89,219
Aug.	81,627	34,627	1,386	117,640
Sept.	99,870	43,420	2,105	145,395
Oct.	95,939	39,824	1,796	137,559
Nov.	77,571	30,031	974	108,576
Dec.	63,852	22,830	571	87,253
YEARLY TOTALS				
1958*	832,522	342,077	13,758	1,188,357
1957	718,113	334,594	14,947	1,067,654
1956	844,362	407,310	20,293	1,271,965
1955	824,643	464,605	17,569	1,306,817

†Data for 1959 not exactly comparable with previous data.
*Monthly figures do not add up to yearly totals because of yearend revisions.
U. S. Bureau of the Census.

Gravity Air-Flow Furnaces†

(Shipments in number of units)

	Gas	Oil	Solid Fuel	Totals
1959				
Jan.	1,916	150	1,541	3,607
Feb.	1,959	136	1,231	3,326
Mar.	2,109	119	1,233	3,461
Apr.	2,171	136	1,393	3,700
May	2,179	115	1,164	3,458
June	1,738	183	2,085	4,006
July	2,410	217	2,056	4,683
Aug.	2,609	249	3,016	5,874
Sept.	3,385	318	3,561	7,264
Oct.	.....	....	....	....
Nov.	.....	....	....	....
Dec.	.....	....	....	....
1958*				
Jan.	1,719	181	1,352	3,252
Feb.	1,364	212	1,376	2,952
Mar.	1,793	163	1,354	3,310
Apr.	1,733	139	1,372	3,244
May	1,782	147	1,182	3,111
June	2,345	221	2,066	4,632
July	2,660	272	1,913	4,845
Aug.	3,729	284	2,546	6,559
Sept.	3,982	398	3,494	7,874
Oct.	4,164	276	3,351	7,791
Nov.	3,499	148	2,503	6,150
Dec.	1,937	102	1,660	3,699
YEARLY TOTALS				
1958*	30,526	2,455	26,467	59,448
1957	30,718	2,792	29,698	63,208
1956	39,211	4,808	38,788	82,807
1955	48,662	5,745	44,920	99,327

†Data for 1959 not exactly comparable with previous data.
*Monthly figures do not add up to yearly totals because of yearend revisions.
U. S. Bureau of the Census.

Cast Iron Radiators and Convectors†

(Shipments in thousands of square feet of radiation)

	1959	1958	1957
January	1,446	1,343	1,712
February	1,415	1,229	1,797
March	1,713	1,890	1,803
April	1,801	1,361	1,723
May	1,074	1,135	1,507
June	1,438	1,440	2,230
July	1,601	1,457	1,769
August	1,731	2,095	2,123
September	2,306	2,643	2,551
October	....	2,765	2,651
November	....	1,775	1,995
December	....	1,253	1,277

YEARLY TOTALS‡

1958	22,350	1956	29,567
1957	24,892	1955	30,863

†Data for 1959 not exactly comparable with previous data.
‡Monthly figures do not add up to yearly totals because of yearend revisions.
U. S. Bureau of the Census.

Plumbing Fixtures

(Shipments—value in thousands)

VITREOUS CHINA AND GLAZED EARTHENWARE

Qtr	1959	1958	1957	1956
1st	$35,470	$30,751	$32,124	$38,300
2nd	39,013	30,777	34,173	38,760
3rd	42,056	32,190	34,029	36,764
4th	.....	33,071	27,714	33,027
Totals	.....	$126,789	$128,040	$146,851

1955	$137,677	1953	$91,047
1954	109,836	1952	85,230

ALL METAL—EXCLUSIVE OF FITTINGS

Qtr	1959	1958	1957	1956
1st	$48,692	$40,990	$44,663	$50,857
2nd	53,895	45,157	48,154	51,328
3rd	55,371	48,415	43,985	54,423
4th	.....	44,730	38,578	42,087
Totals	.....	$179,292	$175,380	$198,695

1955	$225,350	1953	$186,690
1954	196,704	1952	176,136

CAST IRON

Qtr	1959	1958	1957	1956
1st	$31,153	$26,928	$30,040	$33,881
2nd	34,684	28,983	31,803	34,175
3rd	35,132	30,757	27,197	35,511
4th	.....	27,905	25,373	27,392
Totals	.....	$114,573	$114,413	$130,959

1955	$148,517	1953	$125,239
1954	130,821	1952	119,654

STEEL

Qtr	1959	1958	1957	1956
1st	$17,412	$13,935	$14,402	$16,763
2nd	19,065	16,068	16,141	16,886
3rd	20,081	17,538	16,593	18,667
4th	.....	16,716	13,011	14,490
Totals	.....	$64,257	$60,147	$66,806

1955	$75,996	1953	$60,587
1954	65,371	1952	55,586

ALUMINUM, MONEL & OTHER METAL

Qtr	1959	1958	1957	1956
1st	$27	$127	$221	$213
2nd	146	106	210	267
3rd	158	120	195	245
4th	...	109	194	205
Totals	...	$462	$820	$930

1955	$837	1953	$864
1954	512	1952	896

U. S. Bureau of the Census.

Electric Lamps (Bulbs)

(Shipments—value in thousands)

	Domestic	Export	Totals
1959 (9 Mo.)	$320,554	$13,154	$333,708
1st Qtr	103,574	4,046	107,620
2nd Qtr	112,508	4,270	116,778
3rd Qtr	104,472	4,838	109,310
4th Qtr	.....	.....	.....
1958	380,709	14,866	395,575
1957	378,240	18,132	396,372
1956	357,434	15,796	373,230
1955	323,172	14,254	337,426
1954	290,619	11,439	302,058
1953	277,529	11,819	289,348
1952	229,899	8,206	238,105

PRODUCTION

(Thousands of lamps)

1959 (9 Mo.)	1,994,588	1955	2,484,613
1958	2,321,063	1954	2,246,746
1957	2,626,724	1953	2,247,700
1956	2,717,945	1952	n.a.

n.a.=not available.
U. S. Bureau of the Census.

Metal Household Furniture†

(Value of shipments—thousands)

1957	$513,185	1953	$355,327
1956	517,215	1952	334,804
1955	495,394	1951	345,929
1954	416,172	1950	361,221

†A new report giving expanded data for 1958 is expected in early 1960.
U. S. Bureau of the Census.

Mattresses and Bedsprings

(Value of shipments—thousands)

	1959		1958	
	Inner Spring Mattresses	Bedsprings	Inner Spring Mattresses	Bedsprings
Jan.	$16,739	$12,799	$15,301	$11,771
Feb.	16,052	12,330	13,119	10,099
Mar.	16,626	12,455	14,351	10,652
Apr.	16,985	12,721	14,364	10,534
May	17,344	13,129	16,558	12,269
June	18,740	14,401	17,911	13,543
July	19,837	14,534	16,973	12,795
Aug.	.....	.....	20,888	15,641
Sept.	.....	.....	20,698	15,646
Oct.	.....	.....	20,970	16,325
Nov.	.....	.....	13,546	10,674
Dec.	.....	.....	13,157	10,286

YEARLY TOTALS

	Inner Spring Mattresses	Bedsprings	Totals
1958	$197,836	$150,235	$348,071
1957	194,431	144,575	339,006

U. S. Bureau of the Census.

Mechanical Stokers

(Manufacturers' sales—units)

	1958	1957	1956
Residential	11,196	11,342	11,909
Apartment, Commercial, Small Industrial	2,882	3,248	3,824
Large Industrial	236	294	437
Totals	14,314	14,884	16,170

YEARLY TOTALS

1955	16,399	1953	16,658
1954	16,290	1952	23,047

U. S. Bureau of the Census.

Gas Fired Incinerators

(Shipments—units)

1959			
Jan.	2,900	July	4,400
Feb.	2,900	Aug.	4,200
Mar.	3,900	Sept.	4,500
Apr.	3,500	Oct.	5,400
May	3,100	Nov.	....
June	3,500	Dec.	....
1958			
Jan.	3,600	July	3,500
Feb.	3,500	Aug.	4,400
Mar.	4,600	Sept.	5,500
Apr.	3,900	Oct.	4,500
May	3,800	Nov.	4,600
June	3,400	Dec.	6,500

Gas Appliance Manufacturers Association Inc.

Gas Fired Unit Heaters, Duct Furnaces

(Shipments—units)

1959			
Jan.	12,100	July	9,500
Feb.	11,300	Aug.	14,400
Mar.	11,900	Sept.	16,200
Apr.	9,900	Oct.	20,900
May	9,600	Nov.	....
June	11,500	Dec.	....
1958			
Jan.	12,100	July	6,800
Feb.	9,400	Aug.	10,000
Mar.	10,900	Sept.	14,500
Apr.	8,400	Oct.	16,300
May	9,200	Nov.	13,400
June	8,300	Dec.	14,500

Gas Appliance Manufacturers Association Inc.

Gas Conversion Burners

(Shipments—units)

	1959	1958	1957	1956
Jan.	6,700	7,400	7,300	7,900
Feb.	6,100	7,500	6,500	8,400
Mar.	6,000	6,400	8,100	9,200
Apr.	6,300	7,600	10,000	9,600
May	6,900	9,900	8,100	12,000
June	10,500	10,100	10,500	15,600
July	18,900	11,900	15,200	20,200
Aug.	20,200	19,400	23,000	29,100
Sept.	27,700	29,800	29,500	32,200
Oct.	26,300	21,700	24,700	25,300
Nov.	....	9,600	13,700	11,600
Dec.	....	6,900	6,900	5,800
Totals	....	148,200	163,500	186,900

YEARLY TOTALS

1955	209,100	1953	213,100
1954	224,400	1952	277,400

Gas Appliance Manufacturers Association Inc.

Metal Toilet Partitions

1959	Value of Orders Booked	Shipments Units	Shipments Value
1st Qtr	$3,884,000	159,000	$3,693,000
2nd Qtr	4,949,000	192,000	4,397,000
3rd Qtr	4,639,000	207,000	4,742,000
4th Qtr	.....	.....	.....
Totals	.....	.....	.....
1958			
1st Qtr	3,464,000	143,000	3,929,000
2nd Qtr	4,448,000	135,000	3,940,000
3rd Qtr	5,078,000	201,000	4,835,000
4th Qtr	3,976,000	167,000	4,220,000
Totals	$16,966,000	646,000	$16,924,000

U. S. Bureau of the Census.

Appliances

METALWORKING FACTS AND FIGURES

Washer-Dryers

(Factory sales—units)

	1959	1958	1957	1956
Jan.	16,922	13,442	18,645	n.a.
Feb.	20,586	12,396	20,492	n.a.
Mar.	16,207	12,317	21,637	n.a.
Apr.	11,507	11,847	12,665	n.a.
May	11,604	7,780	9,512	n.a.
June	10,423	7,069	9,019	n.a.
July	9,665	7,829	10,145	n.a.
Aug.	18,179	13,659	11,980	9,995
Sept.	25,461	19,806	20,158	9,056
Oct.	24,798	22,843	19,227	10,360
Nov.	.....	17,725	13,762	12,481
Dec.	.....	21,662	12,026	11,601
Totals	.....	168,375	179,268	102,406*

*Includes 48,913 units sold from January through July.
American Home Laundry Manufacturers' Association.

Electric Freezers

(Home and farm)

(Total industry sales—units)

	1959	1958	1957
Jan.	78,800	63,000	68,400
Feb.	90,600	66,500	73,400
Mar.	121,400	75,400	81,400
Apr.	112,900	79,300	70,900
May	121,700	87,900	82,300
June	127,600	121,500	94,800
July	124,600	119,700	109,100
Aug.	108,400	101,400	86,000
Sept.	101,700	121,200	79,000
Oct.	89,600	110,000	71,500
Nov.	.....	89,400	60,800
Dec.	.....	65,600	47,400

YEARLY TOTALS

1958	1,100,900	1954	990,000
1957	925,000	1953	1,090,000
1956	975,000	1952	1,140,000
1955	1,100,000	1951	1,050,000

National Electrical Manufacturers Association.

Standard Vacuum Cleaners

(Sales billed—units)

	1959	1958	1957
Jan.	242,516	265,489	276,738
Feb.	271,396	225,631	300,887
Mar.	346,557	291,418	312,746
Apr.	317,402	247,293	281,627
May	257,345	218,766	231,246
June	275,974	253,127	207,286
July	221,232	263,778	218,276
Aug.	268,465	280,226	241,218
Sept.	305,096	299,618	302,869
Oct.	330,899	339,127	328,655
Nov.	.....	293,609	251,123
Dec.	.....	316,965	237,501

YEARLY TOTALS

1958	3,295,047	1955	3,270,441
1957	3,190,172	1954	2,658,136
1956	3,721,870	1953	2,777,756

Vacuum Cleaner Manufacturers' Association.

Coal and Wood Cooking Stoves†

(Shipments—units)

	1959	1958	1957	1956
Jan.	4,367	3,674	4,178	5,084
Feb.	3,949	3,003	4,716	5,039
Mar.	3,490	3,493	4,000	4,958
Apr.	4,039	2,764	4,716	4,572
May	2,407	2,924	4,669	4,159
June	3,871	3,648	4,757	4,154
July	3,875	3,668	3,908	4,065
Aug.	3,821	4,489	4,497	7,183
Sept.	5,194	5,659	5,451	5,789
Oct.	.....	5,616	6,227	6,536
Nov.	.....	3,985	3,328	5,537
Dec.	.....	4,159	2,350	4,387

YEARLY TOTALS‡

1958	44,708	1956	58,447	1954	66,487
1957	50,281	1955	69,851	1953	83,062

†Data for 1959 not exactly comparable with previous data.
‡Monthly figures do not add up to yearly totals because of yearend revisions.
U. S. Bureau of the Census.

Electric Dishwashers

(Total industry sales—units)

	1959	1958	1957
Jan.	37,900	30,400	37,200
Feb.	41,200	29,200	36,700
Mar.	46,400	32,900	33,100
Apr.	42,600	26,700	26,000
May	36,500	30,600	24,800
June	49,400	34,300	33,500
July	36,500	33,100	27,400
Aug.	46,500	28,400	36,700
Sept.	58,300	39,900	36,700
Oct.	53,500	38,800	35,200
Nov.	.....	45,200	32,800
Dec.	.....	55,500	29,900

YEARLY TOTALS

1958	425,000	1955	295,000
1957	390,000	1954	215,000
1956	400,000	1953	180,000

National Electrical Manufacturers Association.

Oil Cooking Stoves†

(Kerosine, gasoline, and fuel oil)

(Shipments—units)

	1959	1958	1957	1956
Jan.	5,340	6,886	5,934	8,835
Feb.	6,326	8,994	6,950	9,473
Mar.	6,778	9,577	11,027	8,016
Apr.	6,790	4,361	6,954	8,733
May	6,536	6,527	7,649	7,283
June	6,991	5,246	5,656	6,206
July	6,682	4,980	5,880	4,815
Aug.	6,456	6,878	9,278	11,839
Sept.	6,923	6,685	7,094	7,673
Oct.	.....	7,382	6,807	8,512
Nov.	.....	6,446	6,283	5,858
Dec.	.....	4,445	4,982	5,352

YEARLY TOTALS‡

1958	78,407	1956	88,143	1954	109,210
1957	84,494	1955	108,257	1953	117,606

†Data for 1959 not exactly comparable with previous data.
‡Monthly figures may not add up to yearly totals because of yearend revisions.
U. S. Bureau of the Census.

Miscellaneous Equipment

(Manufacturers' unit sales and retail value)

Electric Toasters

(Automatic and nonautomatic)

	Units	Value
1958	3,400,000	$61,290,000
1957	4,000,000	71,874,000
1956	3,980,000	70,541,000
1955	3,565,000	60,242,500
1954	3,457,000	59,889,000

Electric Flat Irons

(Automatic, travel, and steam)

	Units	Value
1958	5,550,000	$86,072,000
1957	7,625,000	112,739,000
1956	8,505,000	119,074,500
1955	7,930,000	112,871,000
1954	6,536,000	95,869,000

Electric Ironers

	Units	Value
1958	35,000	$7,525,000
1957	44,000	9,592,000
1956	64,000	13,760,000
1955	87,100	18,352,000
1954	89,840	18,291,000

Electric Shavers

	Units	Value
1958	6,400,000	$124,800,000
1957	6,650,000	132,667,000
1956	6,600,000	138,600,000
1955	4,750,000	121,125,000
1954	3,957,000	106,839,000

Waffle Irons and Sandwich Grills

	Units	Value
1958	775,000	$15,460,000
1957	895,000	17,855,000
1956	980,000	19,550,000
1955	995,000	18,905,000
1954	928,000	17,354,000

Automatic Electric Coffeemakers

	Units	Value
1958	4,200,000	$79,590,000
1957	4,365,000	85,100,000
1956	5,100,000	98,685,000
1955	3,675,000	71,662,500
1954	3,269,000	65,053,000

Food Mixers

	Units	Value
1958	2,765,000	$67,322,000
1957	3,600,000	97,200,000
1956	4,245,000	119,332,000
1955	3,240,000	103,151,500
1954	2,865,000	94,142,000

Electric Hot Plates

	Units	Value
1958	610,000	$4,850,000
1957	660,000	5,247,000
1956	760,000	6,042,000
1955	950,000	7,362,500
1954	946,000	7,180,000

Portable Electric Heaters

CONVECTOR AND RADIANT

	Units	Value
1958	1,925,000	$56,830,000
1957	1,855,000	54,224,000
1956	1,903,000	56,425,000
1955	1,680,000	50,113,500
1954	1,432,000	37,452,500

FAN FORCED AND FAN-HEATERS

	Units	Value
1958	985,000	$21,621,000
1957	925,000	20,305,000
1956	976,000	19,032,000
1955	880,000	17,160,000
1954	850,000	16,787,500

Electric Fans

	Units	Value
1958	4,332,000	$155,533,000
1957	5,303,000	191,097,000
1956	6,865,000	259,124,000
1955	5,585,000	203,392,000
1954	6,880,000	249,977,500

Deep Fat Fryers

	Units	Value
1958	475,000	$7,576,000
1957	1,100,000	16,445,000
1956	1,450,000	22,475,000
1955	1,925,000	33,687,000
1954	1,693,000	37,077,000

Corn Poppers

	Units	Value
1958	595,000	$3,421,000
1957	550,000	2,887,000
1956	640,000	3,168,000
1955	780,000	4,040,400
1954	815,000	4,605,000

Electric Skillets

	Units	Value
1958	3,750,000	$71,062,000
1957	5,200,000	98,500,000
1956	6,100,000	109,495,000
1955	2,660,000	50,540,000
1954	1,100,000	26,400,000

Steel Kitchen Cabinets

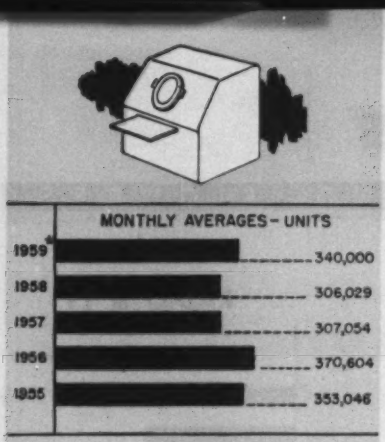
(Including steel cabinet sink units)

(Factory sales)

	Units	Value
1959	1,500,000	$ 96,000,000
1958	1,250,000	80,000,000
1957	2,490,000	150,120,000
1956	3,641,000	188,395,000
1955	4,046,000	209,328,000
1954	3,372,000	174,440,000
1953	3,441,000	178,000,000
1952	2,970,000	154,000,000

Steel Kitchen Cabinet Manufacturers Assn. Inc.

Electrical Merchandising, except where noted otherwise.



WASHERS†

(Sales billed, all types—units)

	1959	1958	1957
Jan.	288,491	244,840	340,913
Feb.	297,526	268,143	331,799
Mar.	329,668	287,884	294,941
Apr.	274,372	224,896	238,423
May	277,934	262,999	262,430
June	341,894	288,831	289,245
July	318,063	277,287	340,915
Aug.	359,849	326,785	334,348
Sept.	394,112	423,073	392,733
Oct.	374,135	404,056	377,621
Nov.	.....	333,035	267,796
Dec.	.....	330,520	213,485

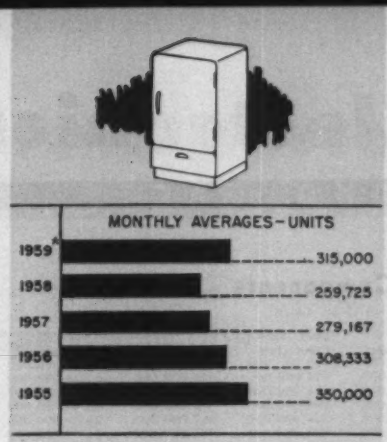
YEARLY TOTALS

1958	3,672,349	1955	4,236,555
1957	3,654,649	1954	3,490,212
1956‡	4,447,254	1953	3,460,396

*Based on estimate made by American Home Laundry Manufacturers' Association.

†Domestic only, 1953-56. Domestic and export, 1957 to date.

‡Includes 102,406 washer-dryers, also reported as dryers.



ELECTRIC REFRIGERATORS

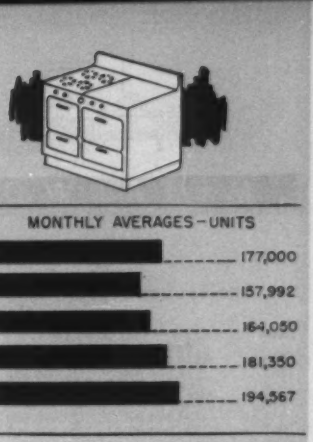
(Total industry sales—units)

	1959	1958	1957
Jan.	256,200	206,100	305,400
Feb.	306,200	227,800	298,700
Mar.	333,700	261,100	309,300
Apr.	301,000	210,800	281,600
May	308,200	262,900	303,700
June	361,000	316,300	305,100
July	370,800	279,700	318,000
Aug.	314,100	246,900	240,500
Sept.	355,700	295,200	265,200
Oct.	329,600	277,500	261,500
Nov.	.....	245,500	246,400
Dec.	.....	286,900	214,600

YEARLY TOTALS

1958	3,116,700	1954	3,600,000
1957	3,350,000	1953	3,650,000
1956	3,700,000	1952	3,570,000
1955	4,200,000	1951	4,075,000

*Estimated.
National Electrical Manufacturers Association.



HOUSEHOLD GAS RANGES†

(Shipments—units)

	1959	1958	1957
Jan.	148,800	128,200	149,700
Feb.	152,400	134,200	161,600
Mar.	171,500	149,300	179,400
Apr.	166,900	148,200	168,800
May	161,300	147,200	156,200
June	171,900	155,900	155,300
July	145,500	129,100	137,400
Aug.	177,200	157,700	182,600
Sept.	210,300	182,100	192,100
Oct.	190,200	211,900	195,500
Nov.	.....	171,100	154,300
Dec.	.....	181,000	135,800

YEARLY TOTALS

1958	1,895,900	1955	2,334,800
1957	1,968,700	1954	2,021,500
1956	2,177,400	1953	2,176,500

*Estimated.
†Data prior to 1955 include free-standing ranges only.
Gas Appliance Manufacturers Association Inc.

Electric Clothes Dryers

(Factory sales—units)

	1959	1958	1957
Jan.	78,593	70,475	108,869
Feb.	69,422	58,630	79,207
Mar.	68,670	51,368	57,047
Apr.	43,945	27,875	28,704
May	31,318	28,515	21,474
June	47,862	34,913	33,161
July	66,791	54,557	52,035
Aug.	87,291	72,350	77,662
Sept.	115,151	110,008	115,126
Oct.	110,834	115,133	126,799
Nov.	.....	98,972	95,640
Dec.	.....	100,726	85,304
Totals	.....	823,522	881,028

American Home Laundry Manufacturers' Association.

Gas Clothes Dryers

(Factory sales—units)

	1959	1958	1957
Jan.	39,627	30,318	36,759
Feb.	36,852	21,053	37,885
Mar.	29,764	20,155	27,632
Apr.	23,807	10,600	15,301
May	14,585	13,383	11,372
June	22,976	19,260	14,535
July	28,457	20,956	18,405
Aug.	45,906	37,483	39,393
Sept.	59,409	48,725	51,347
Oct.	68,835	65,272	60,700
Nov.	.....	43,527	47,515
Dec.	.....	47,944	33,981
Totals	.....	378,676	394,825

American Home Laundry Manufacturers' Association.

Household Electric Ranges†

(Total industry sales—units)

	1959	1958	1957
Jan.	120,800	109,000	144,500
Feb.	134,600	108,700	127,700
Mar.	172,600	117,900	139,400
Apr.	136,100	95,600	107,200
May	133,400	96,000	93,600
June	151,400	116,800	102,300
July	129,200	98,500	88,700
Aug.	116,600	81,400	85,800
Sept.	157,200	121,800	124,800
Oct.	143,400	135,500	120,400
Nov.	.....	129,400	116,800
Dec.	.....	143,900	113,800

YEARLY TOTALS

1958	1,354,500	1953	1,250,000
1957	1,365,000	1952	1,060,000
1956	1,585,000	1951	1,400,000
1955	1,600,000	1950	1,830,000
1954	1,350,000	1949	1,056,000

†Data prior to 1956 include free-standing ranges only.
National Electrical Manufacturers Association.

Gas Water Heaters

(Shipments—units)

	1959	1958	1957
Jan.	266,200	235,400	214,900
Feb.	259,700	216,300	208,200
Mar.	265,900	221,600	226,600
Apr.	261,300	221,900	238,200
May	239,300	210,000	233,400
June	250,000	231,000	211,700
July	245,100	221,400	192,500
Aug.	256,000	215,500	210,300
Sept.	243,600	230,000	215,500
Oct.	273,500	265,900	234,700
Nov.	.....	197,100	173,500
Dec.	.....	207,300	172,800

YEARLY TOTALS

1958	2,673,400	1955	2,748,200
1957	2,532,300	1954	2,360,500
1956	2,762,100	1953	2,182,700

Gas Appliance Manufacturers Association Inc.

Electric Water Heaters

(Total industry sales—units)

	1959	1958	1957
Jan.	62,800	61,700	56,300
Feb.	75,500	58,000	62,600
Mar.	74,900	68,600	66,200
Apr.	71,100	68,500	65,600
May	72,300	66,100	71,500
June	75,800	74,600	70,500
July	66,200	79,000	64,000
Aug.	56,400	61,000	60,500
Sept.	71,000	74,300	69,800
Oct.	.....	76,400	79,400
Nov.	.....	69,700	73,100
Dec.	.....	65,600	60,500

YEARLY TOTALS

1958	823,500	1954	806,000
1957	800,000	1953	780,000
1956	870,000	1952	720,000
1955	900,000	1951	845,000

National Electrical Manufacturers Association.

Food Waste Disposers

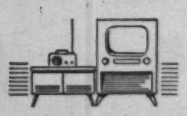
(Plumbed-in only)
(Total industry sales—units)

	1959	1958	1957
Jan.	48,500	40,800	49,800
Feb.	59,000	46,400	43,600
Mar.	61,600	47,800	43,800
Apr.	63,200	40,000	38,400
May	53,600	46,400	35,900
June	64,500	61,300	44,700
July	61,400	49,100	40,100
Aug.	60,500	47,500	47,300
Sept.	81,500	56,200	53,500
Oct.	80,500	53,800	49,900
Nov.	.....	59,400	47,700
Dec.	.....	67,900	55,300

YEARLY TOTALS

1958	616,600	1955	520,000
1957	550,000	1954	410,000
1956	590,000	1953	325,000

National Electrical Manufacturers Association.



Electronics

METALWORKING FACTS AND FIGURES

Electronic Components

(Factory sales—selected years)

	Resistors	Capacitors	Transformers	Tubes, Semi-Conductors	All Other	Totals
1958....	$148,000,000	$210,000,000	$102,000,000	$890,000,000	$850,000,000	$2,200,000,000
1957....	171,000,000	225,000,000	110,000,000	925,000,000	1,004,000,000	2,435,000,000
1956....	175,000,000	224,000,000	98,000,000	853,000,000	938,000,000	2,288,000,000
1955....	150,000,000	215,000,000	96,000,000	800,000,000	939,000,000	2,200,000,000
1954....	130,000,000	200,000,000	103,000,000	708,000,000	867,000,000	2,008,000,000
1952....	100,000,000	200,000,000	150,000,000	604,000,000	676,000,000	1,730,000,000
1951....	n.a.	n.a.	n.a.	473,000,000	n.a.	1,261,000,000
1950....	n.a.	n.a.	n.a.	443,000,000	n.a.	1,140,000,000
1947....	19,000,000	49,000,000	41,000,000	122,000,000	240,000,000	471,000,000

n.a.=not available.
Electronic Industries Association.

Industrial Electronic Equipment

(Factory sales—millions)

	1958	1957	1956	1955	1954
Computers, Processing	$290	$265	$125	$72	$47
Testing, Measuring	220	210	170	145	110
Navigational Aids	100	95	70	65	60
Landmobile Microwave Broadcasting	155	150	120	95	90
Industrial Controls	160	150	115		
Nuclear-Electronic Apparatus	35	27	22		
Medical, Therapeutic	145	139	110	373	343
Commercial Sound	140	136	110		
Communication	40	36	30		
Miscellaneous	95	92	78		
Totals	$1,380	$1,300	$950	$750	$650

Electronic Industries Association.

Receiving Tubes

(Manufacturers' sales)

	1959 Units, Thousands	1959 Value, Thousands	1958 Units, Thousands	1958 Value, Thousands
Jan.	31,150	$26,808	26,805	$23,264
Feb.	33,155	28,630	29,661	25,650
Mar.	39,841	35,286	28,548	25,716
Apr.	29,800	26,047	32,582	28,788
May	30,612	25,904	36,540	31,406
June	37,421	33,099	36,270	31,445
July	36,394	29,786	30,795	26,927
Aug.	35,435	29,974	30,456	25,442
Sept.	41,989	34,594	40,061	33,951
Oct.	.....	.....	41,540	34,362
Nov.	.....	.....	35,640	29,854
Dec.	.....	.....	28,504	25,123
Totals	.....	.....	397,402	$341,928

YEARLY TOTALS

	Units	Value
1957	456,424,000	$384,402,000
1956	464,186,000	374,186,000

Electronic Industries Association.

Television Picture Tubes

(Manufacturers' sales)

	1959 Units	1959 Value, Thousands	1958 Units	1958 Value, Thousands
Jan.	784,906	$15,210	621,910	$12,342
Feb.	738,336	14,085	556,136	11,210
Mar.	717,144	13,804	634,779	12,643
Apr.	696,503	13,275	590,357	11,592
May	667,080	12,746	560,559	11,237
June	766,566	15,137	725,846	14,203
July	750,352	14,648	549,817	11,109
Aug.	823,098	15,494	713,458	14,191
Sept.	913,697	18,067	891,803	17,704
Oct.	.....	.....	969,501	19,398
Nov.	.....	.....	789,283	15,008
Dec.	.....	.....	649,031	12,644
Totals	.....	.....	8,252,480	$163,281

YEARLY TOTALS

	Units	Value
1957	9,721,008	$183,231,337
1956	10,987,021	196,220,240

Electronic Industries Association.

Phonograph Sales

(Selected years—units)

1958.....	3,212,000	1953.....	724,000
1957.....	3,718,000	1952.....	322,000
1956.....	3,338,000	1949.....	384,000
1955.....	2,234,000	1948.....	351,000
1954.....	1,886,000	1947.....	468,000

Electronic Industries Association.

Semiconductor Diodes and Rectifiers

(Factory sales)

	Germanium, Silicon	All Other	Totals
1958..	$97,000,000	$19,000,000	$116,000,000
1957..	73,000,000	30,000,000	103,000,000
1956..	50,000,000	n.a.	n.a.
1955..	30,000,000	n.a.	n.a.
1954..	20,000,000	n.a.	n.a.
1953..	25,000,000	n.a.	n.a.
1952..	20,000,000	n.a.	n.a.

n.a.=not available.
Electronic Industries Association.

Hi-Fi Components

(Factory sales—thousands)

	Receivers, Tuners	Amplifiers	Speakers	Totals
1958.....	$7,900	$13,100	$13,000	$34,000
1957.....	7,900	11,200	14,400	33,500
1956.....	6,500	7,500	12,800	26,800
1955.....	n.a.	n.a.	n.a.	19,000
1954.....	n.a.	n.a.	n.a.	15,400
1952.....	n.a.	n.a.	n.a.	7,500
1950.....	n.a.	n.a.	n.a.	1,900

n.a.=not available.
Electronic Industries Association.

Transistor Sales

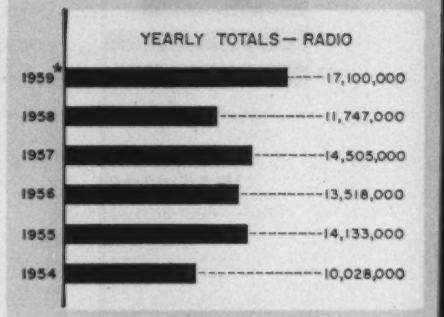
	1959 Units, Thousands	1959 Value, Thousands of Dollars	1958 Units, Thousands	1958 Value, Thousands of Dollars
Jan.	5,195	13,243	2,955	6,704
Feb.	5,393	15,550	3,107	6,806
Mar.	6,310	18,118	2,977	6,795
Apr.	5,907	16,864	2,856	7,025
May	6,358	19,007	2,999	7,251
June	6,934	18,032	3,558	8,262
July	6,030	15,618	2,632	6,599
Aug.	7,130	18,054	4,227	9,976
Sept.	8,653	20,851	5,076	10,811
Oct.	....	.....	5,595	13,462
Nov.	....	.....	5,441	12,442
Dec.	....	.....	5,628	16,596

YEARLY TOTALS

	Units	Value
1958	47,050,814	$112,729,427
1957	28,738,000	69,739,000
1956	12,840,000	37,352,000
1955	3,646,802	9,860,062
1954	1,317,327	5,122,266

Electronic Industries Association.

RADIO & TV



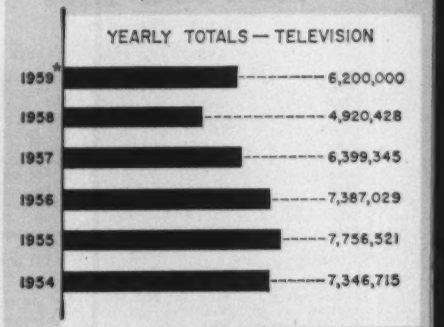
RADIOS

(Number produced)

	Automobile	Other	Totals
1959			
10 Mo.	4,682,962	8,040,008	12,722,970
January	432,551	692,834	1,125,385
February	420,052	704,685	1,124,737
March	511,219	836,335	1,347,554
April	422,346	617,837	1,040,183
May	476,222	563,340	1,039,562
June	637,806	792,359	1,430,165
July	254,725	574,310	829,035
August	279,424	729,999	1,009,423
September	717,501	1,263,707	1,981,208
October	531,116	1,264,602	1,795,718
November	.....	.....	.....
December	.....	.....	.....

YEARLY TOTALS

	Units	Value
1958	11,747,000	$304,116,000
1957	14,505,000	351,601,000
1956	13,518,000	288,474,000
1955	14,133,000	283,225,000
1954	10,028,000	220,616,000
1953	12,852,000	286,471,000



TELEVISION

(Number produced)

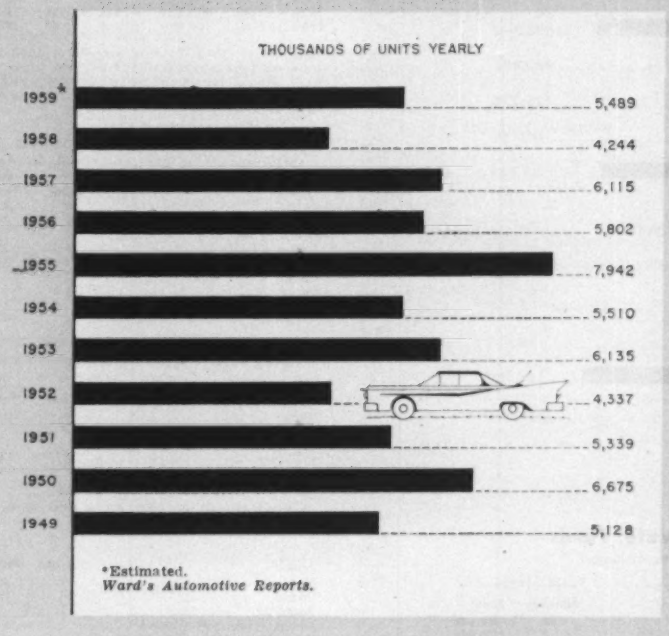
	1959	1958	1957
January	437,026	433,983	450,190
February	459,492	370,413	484,697
March	494,032	416,903	559,842
April	389,251	302,559	361,246
May	431,911	286,982	342,336
June	571,003	377,090	543,778
July	350,360	274,999	360,660
August	547,445	507,526	673,734
September	808,377	621,734	832,631
October	706,583	495,617	661,994
November	.....	437,772	574,646
December	.....	414,850	573,541

YEARLY TOTALS

	Units	Value (Manufacturers')
1958	4,920,428	$667,899,000
1957	6,399,345	832,747,000
1956	7,387,029	938,596,000
1955	7,756,521	1,071,020,000
1954	7,346,715	1,028,540,000
1953	7,215,827	1,230,298,000

*Estimated.
Electronic Industries Association.

U. S. PASSENGER CAR PRODUCTION



*Estimated.
Ward's Automotive Reports.

Trucktrailers

(Shipments)

	1959 Units	1959 Value, Thousands	1958 Units	1958 Value, Thousands
Jan.	4,604	$26,197	3,459	$19,804
Feb.	4,879	27,646	3,078	17,403
Mar.	5,579	31,073	3,527	20,673
Apr.	6,110	33 105	3,619	20,527
May	5,150	32,627	3,953	21,658
June	6,487	34,521	3,847	21,029
July	5,823	32,548	3,959	21,896
Aug.	5,668	32 569	4,269	23,338
Sept.	6,171	34,219	4,495	25,179
Oct.	....	.....	5,066	28,461
Nov.	....	.....	4,262	24,113
Dec.	....	.....	4,973	28,145

YEARLY TOTALS

	Units	Value
1958	48,507	$272,226,000
1957	57,907	304,871,000
1956	64,164	319,476,000
1955	73,708	363,458,000
1954	52,243	238,786,000

U. S. Bureau of the Census.

Autos, Trucks Scrapped

	Passenger Cars	Trucks, Buses	Totals
1957	3,702,000	562,000	4,264,000
1956	4,327,000	621,000	4,948,000
1955	3,773,000	619,000	4 392,000
1954	3,840,000	513,000	4,353,000
1953	3,466,000	588,000	4,054,000
1952	3,163,000	604,000	3,767,000
1951	3,122,000	652,000	3,774,000
1950	2,598,000	636,000	3 234,000
1949	2,616,000	535,000	3,151,000
1948	1,780,000	495,000	2,275,000
1947	1,374,000	437,000	1,811,000

Automobile Manufacturers Association.

Auto Imports

(Passenger cars—units)

	1959	1958	1957
Jan.	52,019	36,074	15.877
Feb.	47,126	28,547	14,685
Mar.	54,184	33,210	21,282
Apr.	55,977	34,716	21,251
May	64,553	34,262	20,381
June	60,321	28,026	21,160
July	65,241	42,285	22,471
Aug.	47,560	34,198	23,255
Sept.	51,821	33,127	18,353
Oct.	.....	39,337	25,609
Nov.	.....	35,929	25,382
Dec.	.....	51,097	29,637

YEARLY TOTALS

1958	430,808	1955	57,115
1957	259,343	1954	34,555
1956	107,675	1953	27,121

Ward's Automotive Reports.

Auto Replacement Parts

(Wholesale value in thousands)

1958	$2,024,000	1946	$1,750,200
1957	2,008,700	1945	1 037,800
1956	1,775,600	1944	780,200
1955	1,805,500	1943	527,710
1954	1,672,500	1942	471,957
1953	1,892,400	1941	718,212
1952	2,164,300	1940	553,004
1951	2,399,400	1939	460,408
1950	1,881,700	1938	360,893
1949	1,809,900	1937	461,775
1948	2,451,500	1936	454,110
1947	2,309,200	1935	373,159

Automobile Manufacturers Association.

U.S. Auto Production

(Units)

	Passenger Cars	Trucks	Totals
1959*	5,488,737	1,128,617	6,617,354
Jan.	545,757	98,558	644,315
Feb.	478,484	100,233	578,717
Mar.	576,085	109,801	685,886
Apr.	578,825	115,159	693,984
May	546,817	112,647	659,464
June	557,994	120,569	678,563
July	555,418	111,010	666,428
Aug.	239,152	55,507	294,659
Sept.	258,157	80,464	338,621
Oct.	507,530	93,036	600,566
Nov.	254,518	49,233	303,751
Dec.	390,000*	82,400*	472,400*
1958	4,244,045	871,330	5,115,375
Jan.	489,515	82,421	571,936
Feb.	392,132	73,361	465,493
Mar.	357,048	72,076	429,124
Apr.	316,594	74,522	391,116
May	349 613	74,242	423,855
June	337,446	69,595	407,041
July	321,017	67,348	388,365
Aug.	180,447	49,901	230,348
Sept.	130,460	47,391	177,851
Oct.	261,701	70,052	331,753
Nov.	514,152	95,186	609 338
Dec.	593,920	95,235	689,155
1957	6,115,458	1,090,200	7,205,658
1956	5,801,864	1,104,325	6,906,189
1955	7 942,132	1,246,442	9,188,574
1954	5,509,550	1,022,609	6,532,159
1953	6,134,534	1,203,835	7,338,369
1952	4,337,481	1,218,045	5,555 526
1951	5,338,820	1,412,149	6,750,969
1950	6,674,933	1,344,227	8 019,160
1949	5 128,187	1,132,138	6,260,325

Ward's Automotive Reports. *Estimated.

Canadian Auto Production

(Units)

	Passenger Cars	Trucks	Totals
1959*	295,332	66,542	361,874
Jan.	29,767	5,023	34,790
Feb.	32,118	5 787	37,905
Mar.	33,487	7 073	40,560
Apr.	36,637	7,917	44,554
May	32,491	7,945	40,436
June	35,435	8,965	44,400
July	27,290	6,906	34,196
Aug.	3,785	2,046	5,831
Sept.	9,779	3,289	13,068
Oct.	22,546	4,545	27,091
Nov.	13,997	3,246	17,243
Dec.	18,000*	3,800*	21,800*
1958	296,624	58,693	355,317
Jan.	28,234	4,862	33,096
Feb.	26,426	4,709	31,135
Mar.	29,172	5,193	34,365
Apr.	32,280	5,441	37,721
May	35,688	5,760	41,448
June	30,707	5,662	36,369
July	21,779	5,267	27,046
Aug.	5,860	3,342	9,202
Sept.	8,007	3,527	11,534
Oct.	16,691	3,810	20,501
Nov.	28,533	5,453	33,986
Dec.*	33,247	5,667	38,914
1957	339,308	70,975	410,283
1956	373,854	101,357	475,211
1955	377,598	75,081	452,679
1954	285,595	66,395	351,990
1953	366,535	117,260	483,795
1952	284,622	149,107	433,729
1951	281,634	133,160	414,794
1950	282,655	105,425	388,080
1949	192,981	97,955	290,936

Ward's Automotive Reports. *Estimated.

Auto Exports

(Passenger cars—units)

1958	125,834	1954	206,544
1957	160,632	1953	186,262
1956	192,708	1952	167,018
1955	254,336	1951	246,965

Ward's Automotive Reports.

Bicycles Shipped

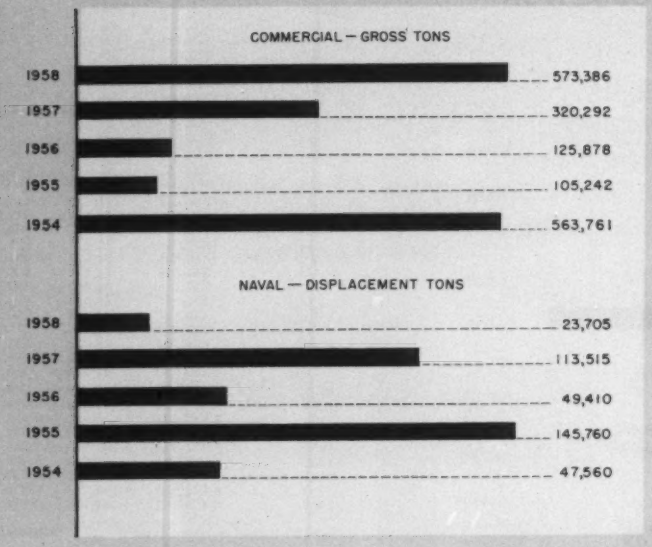
1959*	2,400,000	1954	1,500,000
1958	2,100,000	1953	2,000,000
1957	1,900,000	1952	1,910,000
1956	1,739,710	1951	1,800,000
1955	1,729,300	1950	1,950,000

*Estimated.

Transportation

METALWORKING FACTS AND FIGURES

SHIPS DELIVERED FROM PRIVATE YARDS
(UNITED STATES)



Shipbuilding in U.S. Private Yards
(Steel vessels of 1000 gross tons or more)

	1958		1957	
COMMERCIAL VESSELS	Number	Tonst	Number	Tonst
Under construction Jan. 1	93	2,156,192	84	1,854,606
Canceled during year	9	216,300	3	113,500
Contracted for during year	22	176,000	35	750,706
Totals	106	2,115,892	116	2,491,812
Launched during year	32	719,492	26	388,637
Delivered during year	31	573,386	23	320,292
Under construction Dec. 31	75	1,542,506	93	2,171,520
NAVAL VESSELS				
Under construction Jan. 1	46	280,580	55	285,745
Contracted for during year	17	78,485	14	100,310
Totals	63	359,065	69	386,055
Launched during year	15	55,960	15	39,455
Delivered during year	8	23,705	23	113,515
Under construction Dec. 31	55	335,360	46	272,540

†Gross tons for commercial vessels and displacement tons for Naval vessels. Shipbuilders Council of America.

Civil Aircraft
(Complete airplanes shipped)

	1959		1958	
	Units	Value (Thousands)	Units	Value (Thousands)
January	665	$49,590	582	$63,249
February	619	49,805	518	67,515
March	736	34,014	708	38,417
April	745	68,142	708	48,677
May	759	81,212	630	37,616
June	779	65,098	592	26,421
July	630	88,444	503	41,587
August	647	95,280	471	30,776
September	432	75,950	399	24,401
October	...	.....	628	49,328
November	...	.....	531	34,881
December	...	.....	612	37,672

YEARLY TOTALS

	Number	Value
1958	6,882	$500,540,000
1957	6,805	700,831,000
1956	7,205	454,156,000

U. S. Bureau of the Census.

Civil Aircraft Engines
(Shipments)

	1959		1958	
	Units	Value (Thousands)	Units	Value (Thousands)
January	873	$2,635	1,033	$8,883
February	954	2,729	1,139	9,696
March	921	2,612	994	8,174
April	947	2,728	881	8,174
May	921	2,276	828	6,176
June	979	2,668	783	5,994
July	844	2,043	730	4,898
August	747	1,701	693	3,420
September	804	2,237	757	3,312
October	...	....	811	3,336
November	...	....	786	2,815
December	...	....	798	2,965

YEARLY TOTALS

	Units	Value
1958	10,233	$67,843
1957	10,859	152,456
1956	11,499	108,263

U. S. Bureau of the Census.

Commercial Ship Construction
(Steel self-propelled vessels of 2000 gross tons and over built in private U. S. yards.†)

Year	No.	Gross Tonnage	Year	No.	Gross Tonnage
1958	31	573,386	1952	31	397,156
1957	23	320,292	1951	10	147,569
1956	9	125,878	1950	26	415,499
1955	8	105,242	1949	34	538,873
1954	38	563,761	1948	29	164,482
1953	45	570,326	1947	50	286,473

†On Jan. 1, 1959, 75 steel vessels of 1000 gross tons or over aggregating 1,542,506 gross tons were under construction compared with 93 vessels aggregating 2,171,520 gross tons on Jan. 1, 1958.

TYPES OF VESSELS DELIVERED—1958
(Steel vessels of 1000 gross tons or over)

Type	Number	Gross Tonnage
Tanker	21	462,975
Passenger-Cargo	4	60,700
Ore Carrier	2	27,776
Roll-on Roll-off	1	13,792
Cargo Ship, Ice Strengthened	1	4,157
Cargo Ship, Dock	1	2,486
Ferry	1	1,500
Totals	31	573,386

CONTRACTED FOR IN 1958
(Steel vessels of 1000 gross tons or over)

Type	Number	Gross Tonnage
Cargo	19	167,600
Ferry	3	8,400
Totals	22	176,000

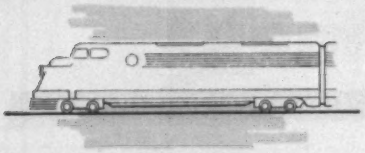
UNCOMPLETED VESSELS
(Steel vessels of 1000 gross tons or over)
Jan. 1, 1959

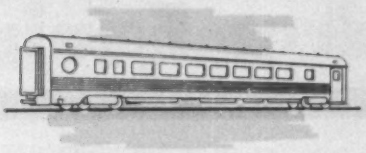
Type	Number	Gross Tonnage
Tanker	47	1,284,806
Cargo	19	167,600
Seatrain	1	8,500
Geodetic Survey Vessel	1	2,800
Passenger-Cargo, Nuclear	1	13,400
Ferry	2	6,900
Ore Carrier	3	44,000
Self-Unloader	1	14,500
Totals	75	1,542,506

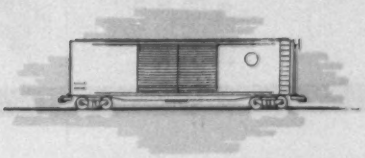
Naval Shipbuilding
(PRIVATE YARDS' NAVAL BACKLOG)
Jan. 1, 1959

Type	Number	Displacement Tonnage
Guided Missile Destroyer	13	42,185
Guided Missile Frigate	12	53,450
Destroyer	5	14,530
Destroyer Escort	4	5,290
Ammunition Ship	3	24,000
Attack Aircraft Carrier, Nuclear	1	67,350
Attack Aircraft Carrier	1	56,300
Guided Missile Cruiser, Nuclear	1	13,000
Guided Missile Frigate, Nuclear	1	7,200
Fleet Ballistic Missile Submarine, Nuclear	4	22,510
Submarine, Nuclear	5	14,240
Submarine	3	5,970
Radar Picket Submarine, Nuclear	1	5,655
Landing Ship, Tank	1	3,680
Totals	55	335,360
CONTRACTED FOR IN 1958		
Guided Missile Destroyer	5	16,225
Guided Missile Frigate	7	32,550
Fleet Ballistic Missile Submarine	4	22,510
Guided Missile Frigate, Nuclear	1	7,200
Totals	17	78,485
DELIVERED IN 1958		
Landing Ship, Tank	3	11,280
Destroyer	3	8,770
Escort Vessel	1	1,285
Submarine, Nuclear	1	2,370
Totals	8	23,705

Shipbuilders Council of America.







New Locomotive Units Put in Service by Class 1 Railroads

	1959	1958	1957	1956	1955
1st Qtr	204	237	377	399	306
2nd Qtr	298	74	358	386	293
3rd Qtr	206	27	284	340	187
4th Qtr	...	96	297	328	396
Totals	...	434	1,316	1,453	1,182

Association of American Railroads.

Trucks Registered in U. S.

	Privately Owned	Publicly Owned	Totals
1958*	10,700,000	500,000	11,200,000
1957	10,492,617	495,897	10,988,514
1956	10,261,827	461,185	10,723,012
1955	9,893,410	442,931	10,336,341
1954	9,406,191	427,181	9,833,372
1953	9,174,573	413,239	9,587,812
1952	8,853,063	390,201	9,243,264

*Estimated.
Automobile Manufacturers Association.

Buses

(Shipments from U. S. factories)

	1959	1958	1957	1956
Jan.	169	327	269	253
Feb.	143	308	238	278
Mar.	245	342	341	434
Apr.	253	344	506	371
May	282	241	462	362
June	267	91	389	503
July	233	358	309	307
Aug.	82	265	315	429
Sept.	134	216	243	368
Oct.	...	149	233	298
Nov.	...	167	241	233
Dec.	...	208	287	228
Totals	...	3,016	3,833	4,064

YEARLY TOTALS

1955	4,023	1950	4,908
1954	4,118	1949	5,511
1953	4,057	1948	12,299
1952	5,375	1947	19,110
1951	9,460	1946	10,188

Automobile Manufacturers Association.

New Transit Equipment Delivered

	Surface Cars	Subway & Elevated Cars	Trolley Coaches	Motor Buses	Totals
1959*	0	205	0	1,400	1,605
1958	0	428	0	1,698	2,126
1957	0	469	0	1,946	2,415
1956	0	376	0	2,759	3,135
1955	0	288	43	2,098	2,429
1954	0	260	0	2,225	2,485
1953	0	0	0	2,246	2,246
1952	19	0	224	1,749	1,992
1951	56	140	600	4,552	5,348
1950	4	199	179	2,668	3,050
1949	273	415	680	3,358	4,726
1948	478	248	1,430	7,009	9,165

*Estimated.
American Transit Association.

Batteries Shipped

(Automotive replacement only—thousands)

	1959	1958	1957	1956	1955	1954
Jan.	2,672	2,004	2,638	2,058	1,518	1,836
Feb.	1,791	1,803	1,961	1,340	1,691	1,461
Mar.	1,376	1,577	1,254	1,348	1,356	1,226
Apr.	1,437	1,242	1,178	1,368	1,315	1,180
May	1,593	1,454	1,605	1,761	1,614	1,429
June	2,118	1,773	1,878	1,807	1,842	1,883
July	2,556	2,101	2,469	2,178	2,078	2,350
Aug.	2,728	2,333	2,856	2,571	2,852	2,548
Sept.	2,893	2,704	2,688	2,711	3,120	2,800
Oct.	....	2,976	3,042	3,015	3,120	2,739
Nov.	....	2,262	2,359	2,592	2,697	2,475
Dec.	....	3,041	2,015	2,265	2,625	1,844
Totals	....	25,270	25,943	25,014	25,828	23,771

U. S. Department of Commerce.

Railroad Passenger Cars

(Domestic shipments—number of cars)

	1959	1958	1957	1956	1955
Jan.	0	39	3	42	18
Feb.	0	18	11	53	21
Mar.	0	10	3	54	27
Apr.	0	0	7	25	25
May	0	2	6	44	41
June	0	16	17	36	48
July	0	20	15	22	33
Aug.	4	0	40	43	42
Sept.	5	3	185	42	350
Oct.	11	10	376	25	204
Nov.	10	4	5	5	38
Dec.	..	2	37	5	39

MONTHLY AVERAGES

1958	12	1952	10
1957	59	1951	15
1956	33	1950	80
1955	74	1949	78
1954	29	1948	74
1953	32	1947	72
		1946	111
		1945	78
		1944	84
		1943	57
		1942	35
		1941	29

(Domestic orders—number of cars)

	1959	1958	1957	1956	1955
Jan.	0	22	7	75	40
Feb.	36	5	15	6	0
Mar.	60	0	10	1	273
Apr.	0	0	0	5	5
May	0	0	1	0	152
June	25	0	12	53	23
July	0	0	10	0	28
Aug.	0	30	0	0	2
Sept.	50	0	0	70	6
Oct.	0	1	23	9	45
Nov.	0	5	0	0	4
Dec.	..	0	0	50	500
Totals	..	63	78	269	1,078

YEARLY TOTALS

1954	610	1951	261
1953	164	1950	102
1952	520	1949	109

American Railway Car Institute.

Freight Cars Ordered

(Domestic—units)

	Car-builders	Railroad Shops	Totals
1959			
10 Mo.	31,517	11,657	43,174
Jan.	1,069	2,938	4,007
Feb.	1,292	511	1,803
Mar.	7,367	3,425	10,792
Apr.	3,199	537	3,736
May	3,415	1,788	5,203
June	7,238	816	8,054
July	2,519	1,640	4,159
Aug.	1,753	0	1,753
Sept.	943	2	945
Oct.	2,722	0	2,722
Nov.	....	....	....
Dec.	....	....	....
1958	12,326	5,088	17,414
Jan.	375	26	401
Feb.	208	79	287
Mar.	203	1	204
Apr.	300	100	400
May	1,340	51	1,391
June	192	128	320
July	386	0	386
Aug.	771	1,002	1,773
Sept.	1,543	42	1,585
Oct.	606	60	666
Nov.	4,398	1,897	6,295
Dec.	2,004	1,702	3,706

YEARLY TOTALS

1957	23,028	18,994	42,022
1956	30,716	7,983	38,699
1955	83,344	74,958	158,302
1954	14,240	7,736	21,976
1953	23,429	10,136	33,565

American Railway Car Institute.

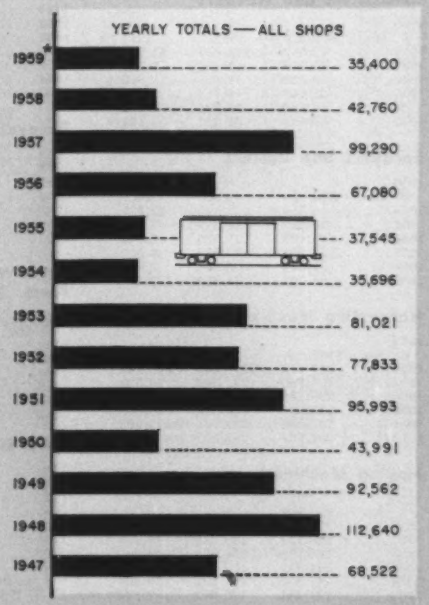
FREIGHT CAR SHIPMENTS

(Domestic—number of cars)

	Car-builders	Railroad Shops	Totals
1959			
10 Mo.	21,480	10,583	32,063
Jan.	982	958	1,940
Feb.	1,657	829	2,486
Mar.	1,766	1,031	2,797
Apr.	2,334	1,407	3,741
May	2,263	1,095	3,358
June	2,927	1,023	3,950
July	3,136	1,137	4,273
Aug.	3,629	1,261	4,890
Sept.	1,481	1,000	2,481
Oct.	1,305	842	2,147
Nov.	....	....	....
Dec.	....	....	....
1958	26,757	16,003	42,760
Jan.	4,836	2,383	7,219
Feb.	3,526	1,790	5,316
Mar.	4,504	1,480	5,984
Apr.	3,820	1,533	5,353
May	2,338	1,370	3,708
June	1,273	1,228	2,501
July	1,145	1,033	2,178
Aug.	1,307	875	2,182
Sept.	1,055	1,143	2,198
Oct.	606	1,052	1,658
Nov.	905	937	1,842
Dec.	1,442	1,179	2,621

YEARLY TOTALS

1957	56,398	42,892	99,290
1956	42,502	24,578	67,080
1955	23,786	13,759	37,545
1954	22,318	13,378	35,696
1953	53,298	27,723	81,021



American Railway Car Institute.

*Estimated.

Farm Equipment

METALWORKING FACTS AND FIGURES

FARM MACHINERY & EQUIPMENT

(Manufacturers' shipments in thousands)

(Except tractors)

	Totals	Domestic	Export
1958	$1,074,527	$1,016,696	$57,831
1957	897,649	828,113	69,536
1956	854,618	779,258	75,360
1955	912,157	844,370	67,787
1954	883,267	n.a.	n.a.
1953	1,003,264	908,705	94,559

Plows and Listers

	Totals	Domestic	Export
1959			
6 Mo.	$38,082	n.a.	n.a.
1958	74,086	$68,776	$5,310
1957	60,733	54,979	5,754
1956	60,956	54,586	6,370
1955	66,417	58,440	7,977
1954	66,506	57,445	9,061
1953	68,703	59,252	9,451

Harrows, Rollers, Pulverizers, Stalk Cutters

1959			
6 Mo.	$57,853	n.a.	n.a.
1958	92,054	$85,074	$6,980
1957	76,275	69,686	6,589
1956	73,775	66,751	7,024
1955	74,706	67,024	7,682
1954	70,605	63,759	6,846
1953	78,785	73,011	5,774

Planting, Seeding, and Fertilizing Machinery

1959			
6 Mo.	$59,828	n.a.	n.a.
1958	101,019	$96,382	$4,637
1957	87,228	82,727	4,501
1956	80,148	75,194	4,954
1955	89,098	84,648	4,450
1954	93,593	89,697	3,896
1953	107,443	103,148	4,295

Cultivators and Weeders

1959			
6 Mo.	$31,289	n.a.	n.a.
1958	48,552	$46,624	$1,928
1957	45,219	43,182	2,037
1956	49,033	46,390	2,643
1955	52,640	49,712	2,928
1954	42,584	39,304	3,280
1953	54,829	51,665	3,164

Sprayers and Dusters

1959			
6 Mo.	$26,178	n.a.	n.a.
1958	40,519	$37,992	$2,527
1957	40,007	36,399	3,608
1956	41,468	37,525	3,943
1955	38,254	33,695	4,559
1954	37,674	33,868	3,806
1953	34,701	31,416	3,285

Harvesting Machinery

1959			
6 Mo.	$169,544	n.a.	n.a.
1958	311,916	$294,948	$16,968
1957	254,390	233,857	20,533
1956	226,139	202,400	23,739
1955	243,561	223,552	20,009
1954	252,566	219,661	32,905
1953	294,024	248,001	46,023

Haying Machinery

1959			
6 Mo.	$96,362	n.a.	n.a.
1958	175,860	$165,740	$10,120
1957	148,139	130,384	17,755
1956	146,771	130,331	16,440
1955	168,447	157,968	10,479
1954	147,883	137,192	10,691
1953	191,441	179,071	12,370

Machines for Preparing Crops for Market or for Use

	Totals	Domestic	Export
1959			
6 Mo.	$19,341	n.a.	n.a.
1958	44,166	$41,636	$2,530
1957	38,634	36,095	2,539
1956	31,437	28,209	3,228
1955	33,070	29,511	3,559
1954	33,892	29,708	4,184
1953	29,919	25,745	4,174

Farm Poultry Equipment

1959	n.a.	n.a.	n.a.
1958	$41,302	$38,610	$2,692
1957	29,690	27,408	2,282
1956	36,088	33,915	2,173
1955	28,429	27,085	1,344
1954	25,566	24,153	1,413
1953	27,216	25,931	1,285

Farm Dairy Machines and Equipment

1959			
6 Mo.	$8,674	n.a.	n.a.
1958	20,602	$18,601	$2,001
1957	20,126	18,473	1,653
1956	21,455	19,741	1,714
1955	19,260	17,241	2,019
1954	22,183	21,310	873
1953	24,370	22,818	1,552

Barn Equipment

1959	n.a.	n.a.	n.a.
1958	$20,393	$19,895	$498
1957	17,733	17,369	364
1956	15,460	15,140	320
1955	12,405	12,084	321
1954	12,856	n.a.	n.a.
1953	15,107	14,951	156

Barnyard Equipment

1959	n.a.	n.a.	n.a.
1958	$28,286	$28,159	$127
1957	18,394	18,272	122
1956	15,619	15,452	167
1955	18,381	n.a.	n.a.
1954	16,742	n.a.	n.a.
1953	12,507	12,439	68

Farm Wagons, Trucks, and Other Farm Transportation Equipment

1959			
6 Mo.	$18,387	n.a.	n.a.
1958	36,792	$36,307	$485
1957	26,102	25,328	774
1956	23,445	22,266	1,179
1955	29,238	28,221	1,017
1954	23,545	n.a.	n.a.
1953	26,555	25,213	1,342

Farm Elevators and Blowers

1959	n.a.	n.a.	n.a.
1958	$38,980	$37,952	$1,028
1957	34,979	33,954	1,025
1956	32,824	31,358	1,466
1955	38,251	36,808	1,443
1954	37,072	n.a.	n.a.
1953	37,664	36,044	1,620

n.a. = not available.
U. S. Bureau of the Census.

Pumps and Windmills

(Factory shipments—units)

	Hand & Windmill Pumps	Pump Jacks	Cylinders	Windmill Heads	Windmill Towers
1959					
Jan.	9,488	2,416	8,588	478	115
Feb.	8,406	2,058	7,137	414	235
Mar.	9,760	1,601	8,474	634	284
Apr.	12,270	972	9,020	630	248
May	9,875	913	9,350	780	338
June	11,795	1,291	9,647	979	425
July	12,935	1,539	11,090	721	338
Aug.	13,594	1,528	9,745	786	389
Sept.	10,192	1,200	9,362	966	406
Oct.	10,302	1,024	9,678	707	377
Nov.	.....	....	....	...	...
Dec.	.....	....	....	...	...
1958	110,651	14,382	95,827	6,983	3,071
Jan.	7,212	1,233	6,758	508	284
Feb.	8,098	915	6,357	650	257
Mar.	9,131	982	6,888	750	362
Apr.	12,419	1,154	7,761	628	276
May	10,618	887	7,937	567	260
June	8,849	1,527	8,467	681	262
July	13,717	1,126	10,061	451	187
Aug.	10,009	1,354	8,704	466	195
Sept.	11,976	1,592	9,300	667	239
Oct.	10,302	1,024	9,678	707	377
Nov.	4,543	1,083	6,942	449	209
Dec.	4,717	1,289	7,561	652	316
1957	142,621	12,035	105,952	6,962	3,208
1956	167,575	21,386	130,863	9,446	4,007
1955	206,881	26,654	157,983	10,482	4,470
1954	223,282	27,136	168,830	11,289	4,911

U. S. Bureau of the Census.

Domestic Water Systems

(Factory shipments—units)

	Jet	Nonjet	Convertible Jet	Submersible	Totals
1959					
Jan.	24,428	6,298	16,479	5,827	53,032
Feb.	24,034	7,668	14,946	5,552	52,200
Mar.	30,207	6,689	20,326	5,552	62,774
Apr.	31,519	8,278	21,499	8,284	69,580
May	31,748	8,416	24,477	8,097	72,738
June	36,954	8,814	24,994	10,552	81,314
July	35,568	9,209	27,929	11,257	83,963
Aug.	32,890	7,788	26,520	9,388	76,586
Sept.	32,309	7,833	24,650	9,880	74,672
Oct.	25,906	7,460	19,652	8,673	61,691
Nov.	.....	....	.....	....	.....
Dec.	.....	....	.....	....	.....
1958	335,263	95,080	186,994	77,633	694,970
Jan.	27,337	8,022	12,929	5,096	53,384
Feb.	19,284	7,509	11,354	4,477	42,624
Mar.	28,424	9,322	11,802	4,400	53,948
Apr.	32,755	9,491	16,877	6,624	65,747
May	32,653	8,889	18,505	7,390	67,437
June	38,117	8,160	19,829	7,536	73,642
July	29,869	8,898	18,168	7,880	64,815
Aug.	28,513	8,790	17,917	7,346	62,566
Sept.	31,101	8,712	18,621	8,396	66,830
Oct.	27,574	7,810	16,582	6,902	58,868
Nov.	20,670	4,448	13,068	6,630	44,816
Dec.	18,966	5,029	11,342	4,956	40,293
YEARLY TOTALS					
1957	360,700	112,483	185,880	65,306	724,369
1956	572,934	134,495	n.a.	62,875	770,304
1955	593,367	151,382	n.a.	51,583	796,332
1954	510,436	167,427	n.a.	43,362	721,225

U. S. Bureau of the Census.

Tractors

(Manufacturers' shipments)

	—Wheel Type†— Number	Value (Thousands)	—Garden Type— Number	Value (Thousands)
1959				
9 Mo.	201,771	$447,701	n.a.	n.a.
1958	239,161	494,131	227,073	$26,492
1957	231,061	419,648	181,806	22,135
1956	222,581	389,841	203,231	25,115
1955	326,437	518,731	192,624	24,000
1954	253,673	396,466	191,235	24,844
1953	387,422	546,641	211,798	29,269
1952	413,151	555,829	202,492	28,098

n.a.=not available.
†Except garden and contractors' off-highway types.
U. S. Bureau of the Census.

INDEXES OF INDUSTRIAL PRODUCTION

(Federal Reserve Board—1947-49 = 100)

Total Industrial Production

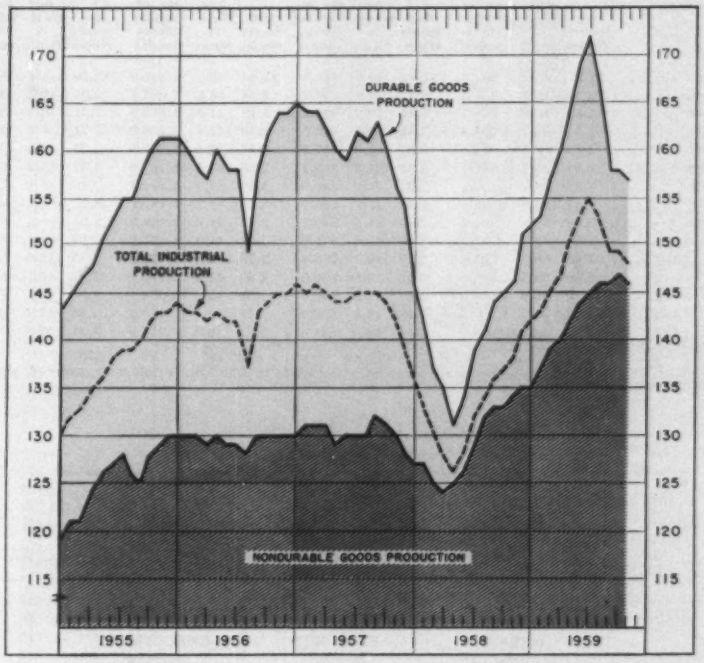
(Adjusted for seasonal variation)

	1959	1958	1957	1956	1955
Jan.	143	133	145	143	132
Feb.	145	130	146	143	133
Mar.	147	128	145	142	135
Apr.	150	126	144	143	136
May	153	128	144	142	138
June	155	132	145	142	139
July	153	134	145	137	139
Aug.	149	136	145	143	140
Sept.	149	137	144	144	142
Oct.	148	138	142	145	143
Nov.	...	141	139	145	143
Dec.	...	142	135	146	144

YEARLY INDEXES

1959	150*	1954	125	1949	97
1958	134	1953	134	1948	104
1957	143	1952	124	1947	100
1956	143	1951	120	1946	90
1955	139	1950	112	1945	107

*Estimated.



Primary Metals

(Adjusted for seasonal variation)

	1959	1958	1957	1956	1955
Jan.	125	100	143	148	127
Feb.	138	95	143	146	131
Mar.	146	91	137	145	136
Apr.	149	86	134	146	138
May	154	91	132	141	140
June	150	103	132	136	143
July	106	102	134	70	134
Aug.	67	109	136	125	139
Sept.	64	113	131	148	146
Oct.	62	122	128	147	148
Nov.	...	123	121	146	149
Dec.	...	123	107	144	150

Metal Fabricating

(Adjusted for seasonal variation)

	1959	1958	1957	1956	1955
Jan.	166	159	178	170	157
Feb.	168	153	180	168	158
Mar.	170	150	179	167	160
Apr.	173	146	176	171	162
May	179	148	176	169	163
June	184	151	179	170	164
July	186	154	179	171	166
Aug.	182	156	178	173	168
Sept.	183	155	176	174	170
Oct.	182	156	172	177	173
Nov.	...	163	170	178	172
Dec.	...	165	163	181	172

Durable Goods

(Adjusted for seasonal variation)

	1959	1958	1957	1956	1955
Jan.	153	142	163	160	145
Feb.	157	137	164	158	147
Mar.	160	135	163	157	148
Apr.	164	131	160	160	151
May	169	134	160	158	153
June	172	139	163	158	155
July	167	141	162	149	155
Aug.	158	144	163	158	158
Sept.	158	145	160	162	160
Oct.	157	146	156	164	161
Nov.	...	151	154	164	161
Dec.	...	152	146	165	161

Nondurable Goods

(Adjusted for seasonal variation)

	1959	1958	1957	1956	1955
Jan.	137	127	130	130	121
Feb.	139	125	131	130	121
Mar.	140	124	131	129	124
Apr.	142	125	130	130	126
May	144	126	131	129	127
June	145	129	131	129	128
July	146	132	131	128	126
Aug.	146	133	132	130	125
Sept.	147	133	131	130	128
Oct.	146	134	130	130	129
Nov.	...	135	128	130	130
Dec.	...	135	127	130	130

Consumer Price Index

(1947-49=100)

	1959	1958	1957	1956
January	123.8	122.3	118.2	114.6
February	123.7	122.5	118.7	114.6
March	123.7	123.3	118.9	114.7
April	123.9	123.5	119.3	114.9
May	124.0	123.6	119.6	115.4
June	124.5	123.7	120.2	116.2
July	124.9	123.9	120.8	117.0
August	124.8	123.7	121.0	116.8
September	125.2	123.7	121.1	117.1
October	125.5	123.7	121.1	117.7
November	....	123.9	121.6	117.8
December	....	123.7	121.6	118.0

MONTHLY AVERAGES

1959*	124.5	1957	120.2
1958	123.5	1956	116.2

*Estimated.
U. S. Bureau of Labor Statistics.

Wholesale Price Indexes

(1947-49=100)

	ALL COMMODITIES		ALL COMMODITIES OTHER THAN FARM PRODUCTS AND FOOD	
	1959	1958	1959	1958
January	119.5	118.9	127.5	126.1
February	119.5	119.0	127.8	125.7
March	119.6	119.7	128.1	125.7
April	120.0	119.3	128.3	125.5
May	119.9	119.5	128.4	125.3
June	119.7	119.2	128.2	125.3
July	119.5	119.2	128.4	125.6
August	119.1	119.1	128.4	126.1
September	119.7	119.1	128.4	126.2
October	119.2	119.0	128.5	126.4
November	....	119.2	....	126.8
December	....	119.2	....	127.2

U. S. Bureau of Labor Statistics.

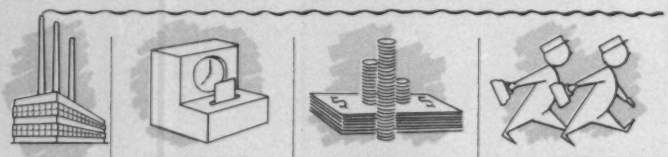
Labor

METALWORKING FACTS AND FIGURES

METALWORKING PRODUCTION WORKERS†

	PRIMARY METALS			FABRICATED METAL PRODUCTS			MACHINERY (Except Electrical)			ELECTRICAL MACHINERY			TRANSPORTATION EQUIPMENT			INSTRUMENTS (Related Products)		
	Avg Hourly Wages	Avg Weekly Hours	No. of Workers (Thousands)	Avg Hourly Wages	Avg Weekly Hours	No. of Workers (Thousands)	Avg Hourly Wages	Avg Weekly Hours	No. of Workers (Thousands)	Avg Hourly Wages	Avg Weekly Hours	No. of Workers (Thousands)	Avg Hourly Wages	Avg Weekly Hours	No. of Workers (Thousands)	Avg Hourly Wages	Avg Weekly Hours	No. of Workers (Thousands)
1959																		
Jan.	$2.77	40.0	952.3	$2.32	40.5	819.6	$2.44	40.7	1,057.3	$2.20	40.4	791.3	$2.62	40.7	1,215.6	$2.24	40.7	212.6
Feb.	2.79	40.4	979.3	2.33	40.4	816.7	2.46	40.9	1,089.7	2.21	40.2	795.5	2.62	40.3	1,203.3	2.25	40.5	212.6
Mar.	2.82	40.9	1,014.7	2.35	40.8	829.2	2.48	41.3	1,112.9	2.21	40.3	798.4	2.63	40.7	1,225.6	2.26	40.5	215.9
Apr.	2.83	41.2	1,037.4	2.35	41.1	839.5	2.49	41.4	1,126.2	2.21	40.2	802.5	2.63	41.0	1,229.0	2.26	40.8	215.9
May	2.84	41.4	1,051.8	2.37	41.5	852.5	2.50	41.6	1,152.6	2.21	40.5	814.2	2.64	40.9	1,232.9	2.26	40.7	218.6
June	2.84	41.7	1,066.5	2.38	41.9	865.8	2.50	41.9	1,167.0	2.22	40.8	832.5	2.66	41.0	1,224.0	2.29	41.2	223.5
July	2.81	38.5	1,038.4	2.37	41.0	846.9	2.50	41.3	1,149.4	2.22	40.1	835.9	2.66	40.8	1,207.4	2.28	41.1	220.8
Aug.	2.64	39.9	628.0	2.38	41.5	815.2	2.50	41.2	1,137.7	2.22	40.3	849.6	2.69	40.2	1,132.0	2.28	40.7	224.0
Sept.	2.66	40.1	609.2	2.39	41.5	840.7	2.51	41.0	1,169.5	2.23	40.6	891.8	2.71	39.9	1,203.9	2.29	41.0	230.2
Oct.	2.64	40.1	583.2	2.38	41.2	809.0	2.51	41.5	1,152.9	2.23	40.9	900.9	2.72	40.0	1,201.4	2.29	41.2	232.3
1958 (Avg)	2.65	38.1	891.0	2.27	40.0	795.8	2.38	39.6	1,039.3	2.15	39.6	750.1	2.53	39.8	1,124.0	2.19	39.9	205.3
1957 (Avg)	2.50	39.5	1,081.6	2.18	40.8	892.5	2.30	41.0	1,255.7	2.07	40.1	857.7	2.41	40.4	1,383.6	2.11	40.3	226.2
1956 (Avg)	2.36	40.9	1,097.4	2.07	41.2	890.5	2.21	42.2	1,278.7	1.98	40.8	870.3	2.31	40.9	1,354.1	2.01	40.8	230.3
1955 (Avg)	2.24	41.2	1,084.8	1.98	41.6	893.6	2.09	41.8	1,178.6	1.88	40.7	822.0	2.23	41.9	1,407.7	1.91	40.8	223.8
1954 (Avg)	2.09	38.7	987.2	1.90	40.7	841.4	2.01	40.6	1,151.5	1.82	39.8	792.5	2.13	40.5	1,327.5	1.83	40.0	225.2

†Data for 1956 to date are adjusted to first quarter, 1957, benchmark. Prior data are not exactly comparable.
U. S. Department of Labor.



	HOURS PER WEEK (average)	HOURLY EARNINGS (average)	ANNUAL EMPLOYMENT (average)
1959*	40.8 HOURS	$2.46	5,020,500
1958	39.5 HOURS	$2.36	4,805,500
1957	40.4 HOURS	$2.26	5,697,300

*Estimated.

Work Stoppages

	Number of Stoppages	Workers Involved	Mandays Lost
1959			
9 Mo.	4,750	3,575,000	48,500,000
Jan.	325	150,000	2,000,000
Feb.	300	140,000	1,500,000
Mar.	350	150,000	1,000,000
Apr.	475	250,000	2,500,000
May	550	300,000	2,750,000
June	700	325,000	2,750,000
July	700	750,000	9,000,000
Aug.	700	750,000	13,000,000
Sept.	650	760,000	14,000,000
	Number of Stoppages Started	**Workers Involved**	**Mandays Lost**
1958	3,694	2,060,000	23,900,000

U. S. Department of Labor.

METALWORKING WAGE & SALARY WORKERS†

(In thousands)

	Primary Metals	Fabricated Metal Products	Machinery, Except Electrical	Electrical Machinery	Transportation Equip.	Instruments, etc.	TOTALS
1959							
Jan.	1,165.5	1,052.8	1,513.8	1,170.1	1,688.7	320.7	6,911.6
Feb.	1,194.9	1,049.2	1,550.4	1,177.9	1,679.4	325.2	6,977.0
Mar.	1,231.4	1,063.3	1,576.7	1,183.7	1,702.1	328.7	7,085.9
Apr.	1,256.0	1,074.1	1,593.2	1,189.6	1,705.9	328.7	7,147.5
May	1,272.8	1,087.2	1,622.7	1,207.4	1,710.4	332.5	7,233.0
June	1,291.4	1,102.0	1,644.9	1,232.6	1,703.7	339.2	7,313.8
July	1,266.1	1,084.1	1,633.9	1,241.6	1,692.8	339.2	7,257.7
Aug.	856.2	1,055.9	1,624.6	1,260.6	1,619.8	343.4	6,760.5
Sept.	836.0	1,081.4	1,656.0	1,303.9	1,688.3	349.9	6,915.5
Oct.	809.8	1,041.7	1,640.1	1,310.1	1,686.0	352.1	6,839.8
1958 (Avg)	1,104.4	1,029.9	1,501.2	1,118.8	1,592.8	315.2	6,662.3
1957 (Avg)	1,309.7	1,132.3	1,737.9	1,223.3	1,878.1	337.9	7,619.2
1956 (Avg)	1,312.6	1,119.0	1,730.1	1,202.1	1,823.4	335.6	7,522.8
1955 (Avg)	1,284.1	1,108.6	1,592.3	1,123.6	1,832.1	321.0	7,261.7
1954 (Avg)	1,181.2	1,049.8	1,555.9	1,086.4	1,735.0	319.0	6,927.3

†Data for 1956 to date are adjusted to first quarter, 1957, benchmark. Prior data are not exactly comparable.
U. S. Department of Labor.

Steel Industry's Minimum Labor Rates

	Hourly wage (cents)	Per cent over 1915
1915	20.0	....
Feb. 1, 1916	22.0	10.0
May 1, 1916	25.0	25.0
Dec. 15, 1916	27.5	37.5
May 1, 1917	30.0	50.0
Oct. 1, 1917	33.0	65.0
Apr. 16, 1918	38.0	90.0
Aug. 1, 1918	42.0	110.0
Oct. 1, 1918	46.2	131.0
Feb. 1, 1920	50.6	153.0
May 16, 1921	40.5	102.5
July 16, 1921	37.0	85.0
Aug. 29, 1921	30.0	50.0
Sept. 1, 1922	36.0	80.0
Apr. 16, 1923	40.0	100.0
August, 1923	44.0	120.0
Oct. 1, 1931	39.6	98.0
May 16, 1932	33.7	68.5
Aug. 19, 1933 (NRA)	40.0	100.0
Apr. 1, 1934	44.0	120.0
November, 1936	52.5	162.5
March, 1937	62.5	212.5
April, 1941	72.5	262.5
July, 1942	78.0	290.0
February, 1946	96.5	382.5
April, 1947	109.0	445.0
July 16, 1948	118.5	492.5
Dec. 1, 1950	131.0	555.0
Mar. 1, 1952	143.5	617.5
June 12, 1953	152.0	660.0
July 1, 1954	157.0	685.0
July 1, 1955	168.5	742.5
Aug. 3, 1956	182.0	810.0
July 1, 1957	189.0	845.0
July 1, 1958	196.0	880.0

Compiled by STEEL.

Steel Employment*, Wages, Hours, and Payrolls

1959 by Months

	Number Employees (Wage and Salaried Workers)	Avg Hr Earnings (Hourly Wage Earners Only)	Avg Hr per Week (Hourly Wage Earners Only)	Total Payrolls (Wages and Salaries)
Jan.	583,800	$3.313	38.1	$348,011,000
Feb.	607,100	3.326	40.4	346,763,000
Mar.	603,635	3.336	41.0	385,414,000
Apr.	649,200	3.340	40.7	400,300,000
May	663,900	3.346	39.9	412,165,000
June	670,400	3.339	40.6	413,541,000
July	a	a	a	a
Aug.	a	a	a	a
Sept.	a	a	a	a
Oct.	a	a	a	a
Nov.	.....	....	...	.....
Dec.	.....	....	...	.....

1958 by Months

Jan.	575,300	$3.042	35.1	$297,612,000
Feb.	554,300	3.088	34.2	261,725,000
Mar.	539,300	3.092	33.6	271,763,000
Apr.	529,100	3.108	33.1	259,093,000
May	526,700	3.095	34.2	270,121,000
June	537,700	3.113	35.5	278,603,000
July	535,700	3.248	32.4	280,090,000
Aug.	542,000	3.265	34.9	296,396,000
Sept.	555,200	3.274	36.5	308,144,000
Oct.	569,000	3.241	39.1	341,690,000
Nov.	571,000	3.314	36.5	320,715,000
Dec.	576,700	3.291	37.3	340,665,000

1957 by Months

Jan.	677,600	$2.831	40.2	$360,620,000
Feb.	677,100	2.852	39.8	327,510,000
Mar.	671,100	2.834	38.7	345,180,000
Apr.	668,200	2.837	38.0	331,520,000
May	666,400	2.824	37.9	338,000,000
June	666,400	2.862	36.7	324,823,000
July	665,300	2.983	34.8	334,600,000
Aug.	663,100	2.990	36.5	343,730,000
Sept.	650,800	3.022	36.4	330,076,000
Oct.	640,300	2.992	38.0	345,580,000
Nov.	625,700	3.013	36.1	316,263,000
Dec.	606,200	3.006	32.9	299,560,000

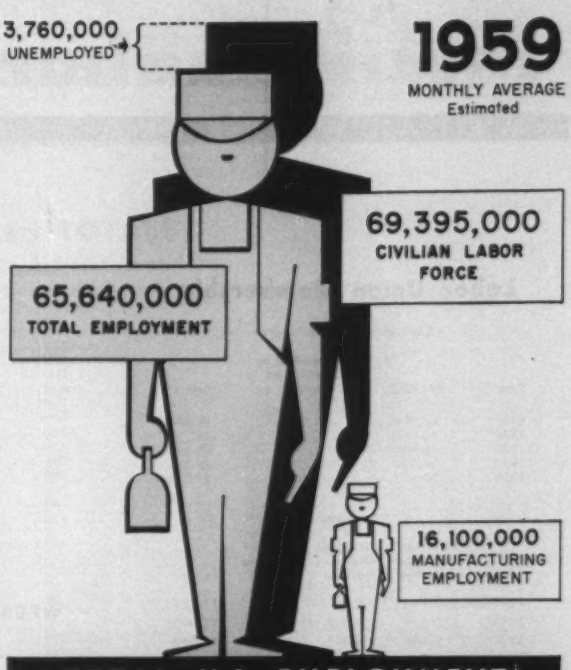
1956 by Months

Jan.	681,100	$2.617	39.5	$329,134,000
Feb.	683,700	2.613	40.5	317,326,000
Mar.	685,200	2.604	40.7	338,140,000
Apr.	687,900	2.621	39.7	326,740,000
May	679,800	2.619	40.1	333,570,000
June	683,000	2.640	39.0	322,400,000
July	a	a	a	a
Aug.	677,200	2.697	34.2	300,920,000
Sept.	687,900	2.784	39.2	338,990,000
Oct.	687,400	2.763	40.6	358,935,000
Nov.	688,900	2.792	39.8	346,041,000
Dec.	688,600	2.804	37.7	347,197,000

MONTHLY AVERAGES AND TOTAL PAYROLLS

1958	551,000	$3.181	35.2	$3,526,617,000
1957	656,517	2.921	37.2	3,997,426,000
1956†	684,609	2.687	39.2	3,659,393,000
1955	657,642	2.501	39.3	3,593,281,000
1954	611,000	2.333	36.1	2,908,339,000
1953	682,800	2.267	39.4	3,356,504,000
1952‡	672,530	2.148	39.5	2,822,250,000
1951	670,717	1.945	40.2	2,881,170,000
1950	635,500	1.746	39.0	2,389,759,000
1949	620,500	1.703	34.5	2,061,770,000
1948	635,600	1.630	39.1	2,234,461,000
1947	616,300	1.513	38.6	1,986,600,000
1946	575,300	1.347	35.1	1,544,142,000
1945	551,200	1.248	44.2	1,645,332,700
1944	571,200	1.219	46.7	1,745,019,700

a—No reports issued because of steelworkers' strike.
*Starting in January, 1957, employment figures exclude those engaged in fabricating.
†Eleven months.
‡Ten months.
American Iron & Steel Institute.



TOTAL U.S. EMPLOYMENT

(In thousands)

1959 by Months

	Civilian Labor Force	Total Employment	Unemployment	Mfg. Employment
Jan.	67,430	62,706	4,724	15,674
Feb.	67,471	62,722	4,749	15,771
Mar.	68,189	63,828	4,362	15,969
Apr.	68,639	65,012	3,627	16,034
May	69,405	66,016	3,389	16,187
June	71,324	67,342	3,982	16,455
July	71,338	67,594	3,744	16,410
Aug.	70,667	67,241	3,426	16,169
Sept.	69,577	66,347	3,230	16,375
Oct.	70,103	66,831	3,272	16,168
Nov.	.....	.....	....	.....
Dec.	.....	.....	....	.....

1958 by Months

Jan.	66,732	62,238	4,494	15,865
Feb.	67,160	61,988	5,173	15,593
Mar.	67,510	62,311	5,198	15,355
Apr.	68,027	62,907	5,120	15,104
May	68,965	64,061	4,904	15,023
June	70,418	64,981	5,537	15,206
July	70,473	65,179	5,294	15,161
Aug.	70,067	65,367	4,699	15,462
Sept.	68,740	64,629	4,111	15,755
Oct.	69,111	65,306	3,805	15,536
Nov.	68,485	64,653	3,833	15,795
Dec.	68,081'	63,973	4,108	15,749

1957 by Months

Jan.	65,821	62,578	3,244	16,936
Feb.	66,311	63,190	3,121	16,930
Mar.	66,746	63,865	2,882	16,917
Apr.	66,951	64,261	2,690	16,806
May	67,893	65,178	2,715	16,744
June	69,842	66,504	3,337	16,839
July	70,228	67,221	3,007	16,702
Aug.	68,994	66,385	2,609	16,949
Sept.	68,225	65,674	2,552	16,903
Oct.	68,513	66,005	2,508	16,783
Nov.	68,061	64,873	3,188	16,561
Dec.	67,770	64,396	3,374	16,302

MONTHLY AVERAGES

1958	68,647	63,966	4,681	15,468
1957	67,946	65,011	2,936	16,782
1956	67,530	64,979	2,551	16,903
1955	65,847	63,193	2,654	16,563
1954	64,468	61,238	3,230	15,995
1953	63,815	62,213	1,602	17,238
1952	62,966	61,293	1,673	16,334
1951	62,884	61,005	1,879	16,104
1950	63,099	59,957	3,142	14,967
1949	62,105	58,710	3,395	14,178
1948	61,442	59,378	2,064	15,321
1947	60,168	58,027	2,142	15,290
1946	57,520	55,250	2,270	14,461
1945	53,860	52,820	1,040	15,302
1944	54,630	53,960	670	17,111

†Data for 1957 forward not exactly comparable with prior data.
U. S. Departments of Commerce and Labor.

Labor

METALWORKING FACTS AND FIGURES

Labor Union Membership

(Thousands of members)

Year	AFL-CIO	Independent or Unaffiliated Unions	Totals
1959*....	15,000	3,500	18,500
1958*....	15,200	3,500	18,700
1957*....	16,800	1,600	18,400
1956.....	16,753	1,573	18,326
1955.....	15,877	1,688	17,565

	American Federation of Labor	Congress of Industrial Organizations	Independent or Unaffiliated Unions	Totals
1954....	10,746	5,185	1,826	17,757
1953*...	10,900	5,200	1,800	17,900
1952*...	9,500	5,000	2,000–2,500	16,500–17,000
1951....	9,500	5,000	2,000–2,500	16,500–17,000
1950....	7,143	n.a.	2,400–2,800	14,000–16,000
1949....	7,241	n.a.	2,000–2,300	14,000–16,000
1948....	7,221	n.a.	2,200–2,500	14,000–16,000
1947....	7,578	6,000	1,836	15,414
1946....	7,152	6,000	1,822	14,974
1945....	6,931	6,000	1,865	14,796
1944....	6,807	5,935	1,879	14,621
1943....	6,564	5,285	1,793	13,642
1942....	5,483	4,195	1,084	10,762
1941....	4,569	5,000	920	10,489
1940....	4,247	3,625	1,072	8,944
1939....	4,006	4,000	974	8,980
1938....	3,623	4,038	604	8,265
1937....	2,861	3,718	639	7,218
1936....	3,422	....	742	4,164
1935....	3,045	....	683	3,728
1934....	2,608	....	641	3,249
1933....	2,127	....	730	2,857
1932....	2,532	....	694	3,226
1931....	2,890	....	636	3,526
1930....	2,961	....	671	3,632
1929....	2,934	....	691	3,625
1928....	2,896	....	671	3,567
1927....	2,813	....	787	3,600
1926....	2,804	....	788	3,592
1925....	2,877	....	689	3,566
1924....	2,866	....	683	3,549
1923....	2,926	....	703	3,629
1922....	3,196	....	754	3,950
1921....	3,907	....	815	4,722
1920....	4,079	....	955	5,034
1919....	3,260	....	786	4,046
1918....	2,726	....	642	3,368
1917....	2,371	....	605	2,976
1916....	2,073	....	649	2,722
1915....	1,946	....	614	2,560
1914....	2,021	....	626	2,647
1913....	1,996	....	665	2,661
1912....	1,770	....	635	2,405
1911....	1,762	....	556	2,318
1910....	1,562	....	554	2,116
1909....	1,483	....	482	1,965
1908....	1,587	....	505	2,092
1907....	1,539	....	538	2,077
1906....	1,454	....	438	1,892

*Estimated by STEEL.
n.a.=not available.
U. S. Department of Labor.

Labor Turnover†

(Rate per 100 employees in manufacturing industries)

	ACCESSIONS				SEPARATIONS					
	New Hires		Totals		Quits		Layoffs		Totals	
	1959	1958	1959	1958	1959	1958	1959	1958	1959	1958
Jan.	1.5	1.0	3.3	2.5	0.9	0.8	1.7	3.8	3.1	5.0
Feb.	1.7	0.9	3.3	2.2	0.8	0.7	1.3	2.9	2.6	3.9
Mar.	1.9	0.9	3.6	2.4	1.0	0.7	1.3	3.2	2.8	4.2
Apr.	2.0	0.9	3.5	2.5	1.1	0.7	1.3	3.0	3.0	4.1
May	2.2	1.0	3.6	3.0	1.3	0.8	1.1	2.4	2.9	3.6
June	3.0	1.6	4.4	3.8	1.3	0.8	1.0	1.8	2.8	2.9
July	2.2	1.5	3.3	3.3	1.3	0.9	1.4	2.0	3.3	3.2
Aug.	2.5	1.6	3.9	3.9	1.8	1.2	1.4	1.9	3.7	3.5
Sept.	2.5	1.9	3.7	4.0	2.2	1.5	1.4	1.6	4.2	3.5
Oct.	..	1.7	..	3.4	..	1.1	..	1.7	..	3.2
Nov.	..	1.3	..	2.8	..	0.8	..	1.6	..	2.8
Dec.	..	1.1	..	2.4	..	0.7	..	1.8	..	2.8

†Data for 1959 not exactly comparable with prior data.
U. S. Department of Labor.

Gross Wages and Hours in Selected Industries

(Production workers)

Iron and Steel Foundries

	EARNINGS (Hourly avg)		HOURS (Weekly avg)	
	1959	1958	1959	1958
Jan.	$2.40	$2.28	39.5	36.1
Feb.	2.40	2.28	39.7	36.3
Mar.	2.42	2.28	40.3	36.2
Apr.	2.43	2.29	40.5	35.6
May	2.45	2.29	41.2	36.1
June	2.44	2.30	41.4	37.0
July	2.43	2.31	40.8	37.3
Aug.	....	2.30	....	37.5
Sept.	....	2.33	....	38.1
Oct.	....	2.32	....	37.9
Nov.	....	2.38	....	38.6
Dec.	....	2.39	....	39.4

Primary Smelting and Refining of Nonferrous Metals

	1959	1958	1959	1958
Jan.	$2.54	$2.42	41.4	40.1
Feb.	2.55	2.44	41.2	40.2
Mar.	2.54	2.43	40.9	40.2
Apr.	2.55	2.42	41.0	40.1
May	2.55	2.43	41.1	39.9
June	2.57	2.43	40.8	39.9
July	2.58	2.47	41.1	39.9
Aug.	....	2.52	....	39.5
Sept.	....	2.52	....	40.1
Oct.	....	2.54	....	40.3
Nov.	....	2.55	....	40.8
Dec.	....	2.55	....	41.2

Fabricated Structural Metal Products

	1959	1958	1959	1958
Jan.	$2.36	$2.27	39.4	40.4
Feb.	2.37	2.28	39.5	39.4
Mar.	2.38	2.30	39.8	39.6
Apr.	2.39	2.29	40.3	39.5
May	2.41	2.30	40.7	39.8
June	2.42	2.31	41.4	40.5
July	2.42	2.35	40.4	40.4
Aug.	....	2.36	....	40.9
Sept.	....	2.37	....	40.7
Oct.	....	2.36	....	40.3
Nov.	....	2.37	....	40.0
Dec.	....	2.37	....	40.1

Agricultural Machinery and Tractors

	1959	1958	1959	1958
Jan.	$2.49	$2.38	40.3	39.7
Feb.	2.56	2.39	41.1	38.8
Mar.	2.58	2.41	41.8	39.4
Apr.	2.57	2.40	41.3	39.9
May	2.57	2.42	41.3	40.5
June	2.58	2.42	41.3	40.2
July	2.57	2.44	39.9	40.1
Aug.	....	2.40	....	39.6
Sept.	....	2.43	....	39.4
Oct.	....	2.43	....	39.7
Nov.	....	2.45	....	36.2
Dec.	....	2.45	....	39.7

U. S. Department of Labor.

Metalworking Machinery

	EARNINGS (Hourly avg)		HOURS (Weekly avg)	
	1959	1958	1959	1958
Jan.	$2.62	$2.51	40.8	39.8
Feb.	2.66	2.54	41.5	39.8
Mar.	2.68	2.58	42.0	40.2
Apr.	2.70	2.60	42.5	40.0
May	2.71	2.61	42.6	39.5
June	2.70	2.59	42.9	39.4
July	2.67	2.56	42.3	38.9
Aug.	....	2.53	....	38.5
Sept.	....	2.54	....	39.1
Oct.	....	2.54	....	39.1
Nov.	....	2.58	....	39.6
Dec.	....	2.59	....	40.6

Electrical Appliances

	1959	1958	1959	1958
Jan.	$2.25	$2.20	39.8	38.0
Feb.	2.25	2.21	38.8	38.2
Mar.	2.26	2.19	39.3	38.1
Apr.	2.25	2.17	39.3	37.7
May	2.25	2.20	38.9	37.4
June	2.26	2.18	39.5	37.8
July	2.27	2.19	39.6	37.9
Aug.	....	2.18	....	38.7
Sept.	....	2.20	....	39.6
Oct.	....	2.20	....	40.1
Nov.	....	2.24	....	41.1
Dec.	....	2.21	....	39.7

Motor Vehicles and Equipment

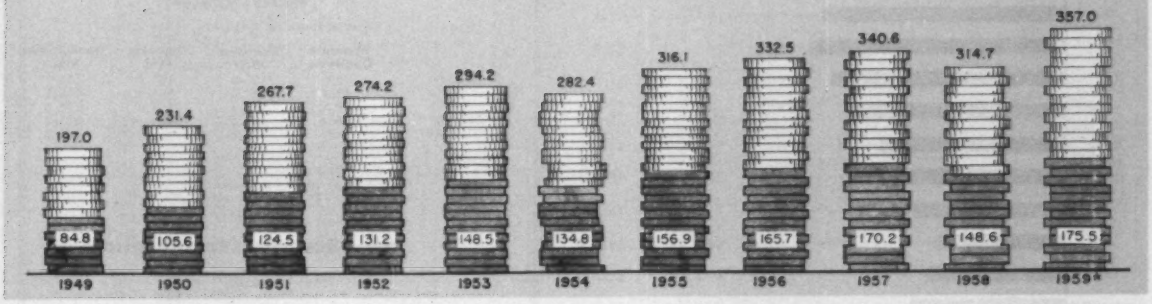
	1959	1958	1959	1958
Jan.	$2.66	$2.48	41.0	37.3
Feb.	2.66	2.48	40.2	37.3
Mar.	2.67	2.50	41.0	38.3
Apr.	2.67	2.50	41.7	38.4
May	2.68	2.51	41.7	38.9
June	2.68	2.51	41.5	39.1
July	2.69	2.51	41.4	38.8
Aug.	2.75	2.54	....	39.3
Sept.	2.77	2.55	....	38.6
Oct.	....	2.52	....	39.7
Nov.	....	2.70	....	41.0
Dec.	....	2.74	....	43.0

Aircraft and Parts

	1959	1958	1959	1958
Jan.	$2.58	$2.43	40.9	40.6
Feb.	2.59	2.44	40.8	40.4
Mar.	2.58	2.44	40.7	40.6
Apr.	2.59	2.44	40.8	40.3
May	2.61	2.48	40.5	40.5
June	2.64	2.51	40.9	40.7
July	2.63	2.54	40.6	40.4
Aug.	2.64	2.55	....	40.8
Sept.	2.65	2.55	....	40.8
Oct.	....	2.57	....	40.5
Nov.	....	2.56	....	40.7
Dec.	....	2.58	....	40.9

ANNUAL SALES TOTALS

(Billions of dollars)
Entire Bar = All Manufacturing Industries
Shaded Area = Durable Goods Industries
*Estimated
U. S. Office of Business Economics



Manufacturers' Sales

(Millions of dollars, shipments, seasonally adjusted)

1959	All Manufacturers	Total Durables	Primary Metals	Fab. Metal Products	Machinery	Transport. Equip.	Other Durables†
Jan.	28,143	13,541	2,230	1,537	4,017	3,167	2,590
Feb.	28,481	13,870	2,421	1,526	4,131	3,168	2,624
Mar.	29,130	14,400	2,580	1,605	4,226	3,212	2,777
Apr.	30,266	15,166	2,792	1,684	4,423	3,385	2,882
May	30,742	15,515	2,858	1,711	4,507	3,463	2,976
June	31,248	15,771	2,916	1,758	4,565	3,558	2,974
July	30,858	15,384	2,104	1,787	4,778	3,667	3,048
Aug.	29,203	14,008	1,227	1,703	4,651	3,577	2,850
Sept.	29,649	14,115	1,200	1,788	4,698	3,601	2,828
Oct.	.....	.....	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....	.....	.....
MONTHLY AVERAGES							
1958	26,229	12,383	1,912	1,440	3,831	2,722	2,478
1957	28,383	14,159	2,321	1,537	4,243	3,333	2,725
1956	27,741	13,805	2,362	1,474	3,988	3,003	2,978
1955	26,341	13,079	2,206	1,356	3,449	3,200	2,868
1954	23,530	11,237	1,676	1,226	3,208	2,635	2,492
1953	24,515	12,375	1,987	1,267	3,470	3,086	2,565
1952	22,850	10,935	1,727	1,135	3,200	2,465	2,408
1951	22,309	10,375	1,924	1,138	2,832	2,134	2,347

†Includes ordnance, professional and scientific instruments, lumber, furniture, stone, clay and glass, and miscellaneous industries.
U. S. Office of Business Economics.

Manufacturers' New Orders

(Millions of dollars, seasonally adjusted)

1959	All Manufacturers	Total Durables	Primary Metals	Fab. Metal Products	Machinery	Transport. Equip.	Other Durables†
Jan.	28,502	13,900	2,727	1,523	3,937	3,038	2,675
Feb.	29,702	14,918	3,236	1,685	4,198	3,038	2,761
Mar.	30,229	15,323	2,681	1,608	4,839	3,437	2,758
Apr.	31,206	15,796	2,826	1,632	4,632	3,655	3,051
May	30,541	15,241	2,479	1,619	4,626	3,498	3,019
June	31,404	16,133	2,578	1,811	4,922	3,841	2,981
July	30,827	15,493	2,018	1,793	4,893	3,631	3,158
Aug.	28,951	13,974	1,689	1,710	4,623	3,185	2,767
Sept.	30,641	15,018	1,965	1,853	5,211	3,130	2,859
Oct.	.....	.....	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....	.....	.....
MONTHLY AVERAGES							
1958	25,904	12,040	1,875	1,404	3,739	2,534	2,486
1957	27,257	13,085	2,125	1,450	3,996	2,847	2,666
1956	28,324	14,442	2,419	1,511	4,237	3,296	2,979
1955	27,171	13,853	2,162	1,424	3,731	3,342	2,894
1954	22,480	10,156	1,560	1,124	2,737	2,291	2,444
1953	23,111	11,032	1,754	1,152	3,138	2,489	2,500
1952	23,582	11,688	1,722	1,143	3,272	3,136	2,414
1951	24,511	12,675	2,050	1,276	3,709	3,216	2,422

†Includes ordnance, professional and scientific instruments, lumber, furniture, stone, clay and glass, and miscellaneous industries.
U. S. Office of Business Economics.

Manufacturers' Inventories

(Millions of dollars, seasonally adjusted at end of month)

1959	All Manufacturers	Total Durables	Primary Metals	Fab. Metal Products	Machinery	Transport. Equip.	Other Durables†
Jan.	49,489	28,106	4,180	2,962	9,008	6,587	5,369
Feb.	49,921	28,408	4,267	3 008	9,086	6,673	5,374
Mar.	50,454	28,925	4,341	3,120	9,215	6,854	5,395
Apr.	51,052	29,361	4,368	3,175	9,346	7,031	5,441
May	51,599	29,734	4,312	3,278	9,482	7,167	5,495
June	52,138	30,227	4,201	3,365	9,725	7,326	5,610
July	52,241	30,349	4,108	3,411	9,802	7,397	5,631
Aug.	52,116	30,145	3,980	3,328	9,826	7,333	5,678
Sept.	51,813	29,749	3,937	3,104	9,745	7,223	5,740
Oct.	.....	.....	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....	.....	.....
YEAREND INVENTORIES							
1958	49,468	27,873	4,297	2,810	8,852	6,639	5,275
1957	53,688	31,137	4,466	2,963	10,283	7,885	5,540
1956	52,515	30,591	4,119	3,056	10,316	7,714	5,386
1955	46,672	26,609	3,546	2,692	8,658	6,849	4,864
1954	43,310	24,133	3,245	2,378	7,923	6,047	4,540
1953	45,736	26,272	3,513	2,634	8,796	6,567	4,762
1952	44,029	24,428	3,119	2,379	8,553	5,773	4,604
1951	43,011	22,815	2,789	2,397	8,055	4,941	4,633

†Includes ordnance, professional and scientific instruments, lumber, furniture, stone, clay and glass, and miscellaneous industries.
U. S. Office of Business Economics.

Manufacturers' Backlogs

(Millions of dollars, end of month)

1959	All Manufacturers	Total Durables	Primary Metals	Fab. Metal Products	Machinery	Transport. Equip.	Other Durables†
Jan.	47,683	44,839	4,991	3,105	16,083	16,286	4,374
Feb.	49,097	46,097	6,121	3,316	16,187	15,955	4,518
Mar.	50,376	47,244	6,362	3,382	16,785	16,078	4,637
Apr.	50,485	47,292	6,086	3,312	16,854	16,233	4,807
May	50,093	46,696	5,626	3,262	16,929	16,001	4,878
June	50,402	46,979	4,950	3,210	17,530	16,366	4,923
July	50,605	47,183	4,914	3,243	17,838	16,049	5,139
Aug.	50,573	47,254	5,382	3,229	17,828	15,743	5,072
Sept.	51,070	47,867	5,989	3,263	18,005	15,661	4,949
Oct.	.....	.....	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....	.....	.....
YEAREND BACKLOGS							
1958	46,797	44,008	4,351	3,060	16,012	16,504	4,081
1957	50,697	48,127	4,796	3,483	17,120	18,750	3,978
1956	64,210	61,015	7,144	4,526	20,083	24,584	4,678
1955	56,861	53,372	6,455	4,077	17,092	21,072	4,676
1954	46,900	44,081	3,381	3,268	13,708	19,372	4,352
1953	59,496	57,060	4,766	4,497	19,365	23,490	4,942
1952	76,343	73,176	7,563	5,871	23,347	30,651	5,744
1951	67,553	64,141	7,620	5,776	22,487	22,596	5,662

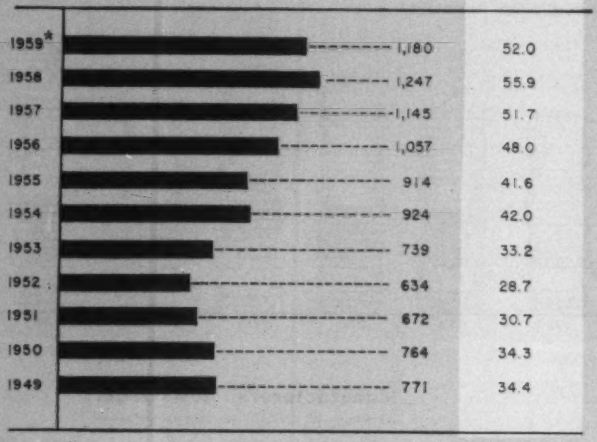
†Includes ordnance, professional and scientific instruments, lumber, furniture, stone, clay and glass, and miscellaneous industries.
U. S. Office of Business Economics.

Trade

METALWORKING FACTS AND FIGURES

BUSINESS FAILURES

Total Monthly Averages



ANNUAL RATE OF FAILURES†

	FAILURES Totals	FAILURES Construction	FAILURES Mfg., Mining	LIABILITIES Construction	LIABILITIES Mfg., Mining
1959					
January	1,273	188	215	$8,274,000	$17,062,000
February	1,161	164	207	6,911,000	17,444,000
March	1,263	185	210	11,589,000	22,558,000
April	1,292	166	202	8,623,000	16,501,000
May	1,135	172	199	12,262,000	10,835,000
June	1,244	167	203	8,519,000	12,143,000
July	1,071	137	203	11,328,000	14,592,000
August	1,135	181	187	12,061,000	18,559,000
September	1,144	191	192	12,595,000	15,974,000
October	1,125	164	221	7,131,000	20,980,000
November	....	...	...	.....	.....
December	....	...	...	.....	.....
MONTHLY AVERAGES					
1959	1,180	...	...	.....	.....
1958	1,247	180	223	$9,592,900	$20,466,500
1957	1,145	175	201	9,192,700	16,403,400
1956	1,057	153	190	8,400,250	15,935,833
1955	914	117	184	6,931,583	13,078,750
1954	924	109	190	4,735,750	14,273,667
1953	739	85	155	3,610,583	13,237,833
1952	634	70	132	3,012,083	8,746,167
1951	672	80	128	3,123,000	7,581,000
1950	764	76	173	2,138,000	7,925,000
1949	771	70	194	2,270,000	11,939,000

†Apparent number of failures per 10,000 listed enterprises. *Estimated.
Dun & Bradstreet Inc.

Businesses in Operation

(Seasonally adjusted—thousands)

	1959	1958	1957	1956	1955
1st Qtr.	4,621	4,557	4,503	4,419	4,323
2nd Qtr.	4,645	4,570	4,520	4,442	4,347
3rd Qtr.	4,666	4,586	4,536	4,464	4,371
4th Qtr.	....	4,603	4,548	4,484	4,395

YEARLY TOTALS†

(Not seasonally adjusted—thousands)

	Mining & Quarrying	Construction	Durables Mfg.	Nondurables Mfg.
1959	42.0	475.9	157.7	173.3
1958	42.3	467.6	158.9	174.1
1957	42.2	465.4	158.0	174.4
1956	40.9	451.7	152.1	175.2
1955	38.8	429.8	149.4	176.7

†On Jan. 1 of each year.
U. S. Office of Business Economics.

New Business Incorporations

	1959†	1958†	1957	1956	1955
January	18,839	13,140	13,387	13,363	13,181
February	15,791	10,497	10,791	12,503	11,369
March	18,176	11,705	12,049	12,822	13,417
April	17,615	11,380	12,312	12,475	11,756
May	16,721	11,987	12,220	13,142	12,029
June	16,208	12,032	11,269	11,952	12,605
July	16,650	12,504	11,686	11,513	10,893
August	14,406	12,280	11,361	11,339	10,983
September	14,664	12,958	10,526	9,583	11,024
October	14,526	13,669	11,251	11,546	10,698
November	.....	12,117	9,270	9,749	10,157
December	.....	16,512	10,575	10,788	11,539
Totals	.....	150,781	136,697	140,775	139,651
Monthly Avg	16,360	12,565	11,391	11,731	11,638

†Includes Hawaii.
Dun & Bradstreet Inc.

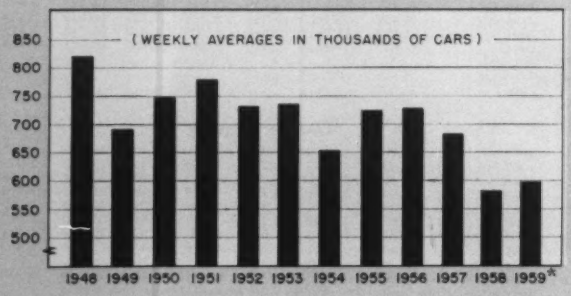
Foreign Trade

(Value—millions of dollars)

	Exports† 1959	Exports† 1958	Exports† 1957	Imports 1959	Imports 1958	Imports 1957
Jan.	1,400.4	1,504.6	1,681.2	1,154.2	1,095.9	1,114.8
Feb.	1,280.2	1,344.9	1,616.0	1,118.1	956.4	992.9
Mar.	1,456.3	1,552.7	2,153.7	1,300.9	1,071.6	1,132.6
Apr.	1,468.0	1,529.8	1,866.2	1,220.9	1,056.8	1,118.7
May	1,551.8	1,638.0	1,817.2	1,263.8	1,060.9	1,105.8
June	1,425.7	1,406.3	1,789.7	1,369.4	1,031.3	986.0
July	1,468.6	1,415.6	1,696.7	1,248.4	1,049.1	1,147.8
Aug.	1,396.7	1,396.4	1,681.2	1,189.8	950.2	1,042.7
Sept.	1,479.0	1,360.9	1,543.9	1,391.8	1,074.0	1,007.4
Oct.	....	1,598.9	1,679.9	.....	1,141.8	1,148.1
Nov.	....	1,596.2	1,688.2	.....	1,089.0	1,043.2
Dec.	....	1,513.6	1,636.4	.....	1,253.4	1,142.4

†Including re-exports.
U. S. Bureau of the Census.

FREIGHT CARLOADINGS



1959—By Weeks

Jan. 3	467,699	May 2	674,123	Sept. 5	544,089
Jan. 10	550,090	May 9	677,398	Sept. 12	480,647
Jan. 17	586,254	May 16	694,380	Sept. 19	578,240
Jan. 24	555,547	May 23	685,745	Sept. 26	587,079
Jan. 31	582,636	May 30	687,726	Oct. 3	572,502
Feb. 7	565,397	June 6	682,624	Oct. 10	558,780
Feb. 14	567,134	June 13	709,139	Oct. 17	580,768
Feb. 21	583,181	June 20	723,738	Oct. 24	607,347
Feb. 28	575,583	June 27	697,633	Oct. 31	588,148
Mar. 7	595,930	July 4	573,325	Nov. 7	560,658
Mar. 14	595,302	July 11	554,426	Nov. 14	638,408
Mar. 21	603,178	July 18	585,070	Nov. 21	629,362
Mar. 28	603,755	July 25	536,430	Nov. 28	574,126
Apr. 4	590,133	Aug. 1	544,464	Dec. 5	.....
Apr. 11	618,359	Aug. 8	532,304	Dec. 12	.....
Apr. 18	633,546	Aug. 15	543,844	Dec. 19	.....
Apr. 25	647,282	Aug. 22	542,561	Dec. 26	.....
		Aug. 29	548,820		

Association of American Railroads. *Estimated.

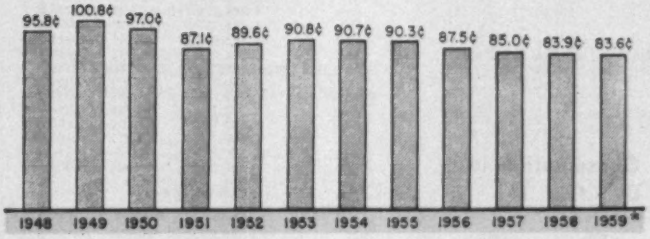
Finance

METALWORKING FACTS AND FIGURES

PURCHASING POWER OF THE DOLLAR

(1947-49=100)

(MONTHLY AVERAGES AS MEASURED BY WHOLESALE PRICES)



AS MEASURED BY:	Wholesale Prices	Consumers' Prices
1959		
Jan.	83.7	80.8
Feb.	83.7	80.8
Mar.	83.6	80.8
Apr.	83.3	80.7
May	83.4	80.6
June	83.5	80.3
July	83.7	80.1
Aug.	84.0	80.1
Sept.	83.5	79.9
Oct.	83.9	...
Nov.	...	...
Dec.	...	...
Monthly Averages		
1958	83.9	81.0
1957	85.0	83.2
1956	87.5	86.1
1955	90.3	87.3
1954	90.7	87.1
1953	90.8	87.4
1952	89.6	88.1
1951	87.1	90.1
1950	97.0	97.3
1949	100.8	98.2

*Estimated.
U. S. Office of Business Economics.

National Income

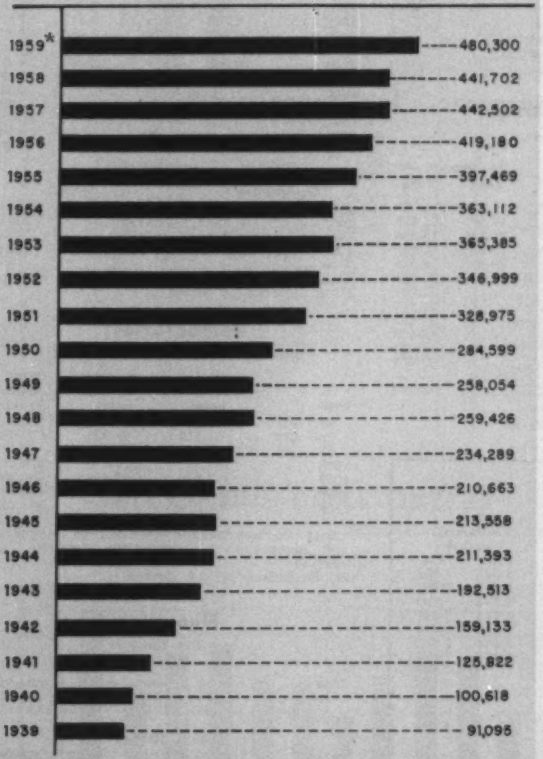
(Millions of dollars)

1959.*	400,800
1958..	366,183
1957..	366,503
1956..	350,836
1955..	330,206
1954..	301,794
1953..	305,573
1952..	292,155
1951..	279,313
1950..	241,876
1949..	217,690
1948..	223,487
1947..	198,177
1946..	180,879
1945..	181,248
1944..	182,639
1943..	170,310
1942..	137,694
1941..	104,710
1940..	81,634
1939..	72,753
1938..	67,581

*Estimated.
Department of Commerce.

GROSS NATIONAL PRODUCT

(Millions of dollars)



*Estimated. Department of Commerce.

U. S. Revenues, Expenditures, Debt

Fiscal Year	Net Receipts (millions)	Per Capita Receipts	Expenditures (millions)	Per Capita Expenditures	Gross Debt (millions)	Per Capita Debt
1959	$68,158	$385.31	$78,896	$446.02	$284,706	$1,609.51
1958	69,116	397.63	71,937	413.85	276,343	1,589.80
1957	71,031	415.43	69,433	406.09	270,527	1,582.21
1956	68,165	406.09	66,539	396.40	272,751	1,624.89
1955	60,389	365.89	64,568	391.21	274,374	1,662.41
1954	64,654	398.64	67,722	417.86	271,260	1,672.51
1953	64,596	405.19	73,985	464.08	266,071	1,668.10
1952	62,129	396.31	66,146	421.93	259,105	1,652.77
1951	48,142	312.36	44,632	289.59	255,222	1,655.97
1950	37,043	244.42	40,167	265.03	257,357	1,698.13
1949	38,246	256.68	40,057	268.83	252,770	1,696.44
1948	44,746	306.24	36,326	248.61	252,292	1,726.68
1947	44,703	311.77	42,505	296.44	258,376	1,801.94
1946	43,037	305.25	65,018	461.17	269,422	1,910.97
1945	46,456	332.78	100,404	719.25	258,682	1,853.01
1944	44,149	319.92	93,743	679.29	201,003	1,455.52
1943	22,281	163.25	78,182	572.83	136,696	1,001.55
1942	12,799	95.25	32,491	241.80	72,422	537.35
1941	7,607	57.29	12,774	74.16	48,961	367.54
1940	5,387	44.09	9,127	70.65	42,967	325.63
1939	5,164	43.21	8,765	70.65	40,445	308.34
1938	5,854	47.89	7,304	59.70	37,167	285.43
1937	5,028	40.93	8,281	62.69	36,427	281.82
1936	4,115	32.17	9,068	69.41	33,545	261.20
1935	3,800	29.88	7,583	58.00	28,701	225.07
1934	3,115	24.64	6,370	56.19	27,053	213.65
1933	2,079	16.54	4,325	40.91	22,538	179.21
1932	2,005	16.06	4,948	41.28	19,487	155.93
1931	3,190	25.70	4,091	32.99	16,801	135.37
1930	4,177	33.01	3,994	32.42	16,185	131.49
1929	4,033	33.19	3,848	31.67	16,931	139.40
1928	4,042	33.73	3,643	30.40	17,604	146.69
1927	4,129	34.94	3,493	29.56	18,510	156.04
1926	3,962	33.98	3,584	30.76	19,643	167.70
1925	3,780	32.91	3,529	30.73	20,516	177.82
1924	4,012	35.44	3,507	30.98	21,251	186.86

Annual Statements of the Treasury.

Corporate Income, Taxes, Dividends

(All industries—millions of dollars)

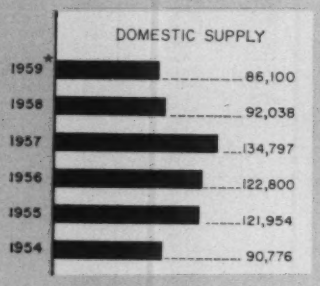
	Income Before Taxes	Taxes†	Income After Taxes	Cash Dividend Payments	Undistributed Income
1959					
1st Qtr ...	46,500§	22,600	23,800	3,059	.....
2nd Qtr ...	52,600§	25,600	27,000	2,950	.....
1958	37,105	18,184	18,921	12,409	6,512
1957	43,281	21,085	22,196	12,495	9,701
1956	44,683	21,227	23,456	12,132	11,324
1955	44,862	21,827	23,035	11,215	11,820
1954	34,061	17,220	16,841	9,839	7,002
1953	38,311	20,222	18,089	9,225	8,864
1952	36,691	19,459	17,232	8,954	8,278
1951	42,153	22,447	19,706	9,029	10,677

†Federal and state corporate income and excess profits tax liability.
§Seasonally adjusted annual rates.
Department of Commerce.

Iron Ore Supply

Exclusive of stocks on hand

(Thousands of gross tons)



(Gross tons)

1959	U. S. Mine Production†	Imports†	Exports	Total Domestic Supply
Jan.	3,409,000	1,989,801	47,266	5,331,535
Feb.	3,661,000	1,482,136	42,769	5,100,367
Mar.	3,863,000	1,873,364	53,846	5,682,518
Apr.	6,163,000	1,939,894	23,957	8,078,937
May	12,165,000	3,301,173	436,327	15,029,846
June	12,371,000	4,123,699	456,443	16,038,256
July	5,672,000	3,187,857	1,020,168	7,839,689
Aug.	630,000	3,181,369	259,706	3,551,663
Sept.	.....	.....	.....	.....
Oct.	.....	.....	.....	.....
Nov.	.....	.....	.....	.....
Dec.	.....	.....	.....	.....
1958	67,947,000	27,530,000	3,439,000	92,038,000
1957	106,148,000	33,651,000	5,002,000	134,797,000

*Estimated.
†Exclusive of manganiferous ore.
U. S. Bureau of the Census.

Iron Ore Stocks†

(At furnaces and docks in U. S.; gross tons)

	1959	1958
January	65,841,574	64,036,404
February	59,071,292	59,207,568
March	52,173,547	55,402,195
April	43,171,061	51,025,872
May	36,462,804	47,942,864
June	41,120,267	47,836,807
July	47,889,630	52,497,184
August	.....	58,594,230
September	.....	63,473,837
October	.....	68,012,807
November	.....	71,698,289
December	.....	71,216,426

†On first day of month.
American Iron Ore Association and American Iron and Steel Institute.

Iron Ore Consumption in U. S.†

(Gross tons)

	1959	1958
January	9,827,765	7,605,229
February	9,699,249	6,484,480
March	11,512,241	6,947,341
April	11,539,631	5,933,695
May	11,848,410	6,216,820
June	11,131,356	6,674,027
July	.....	6,623,664
August	.....	7,418,632
September	.....	7,899,781
October	.....	9,127,828
November	.....	9,261,709
December	.....	9,587,958

†Includes ore agglomerates.
American Iron Ore Association and American Iron & Steel Institute.

Lake Superior Iron Ore

(Shipments from Upper Lake ports; gross tons)

	1959	1958	1957
Jan.	none	none	none
Feb.	none	none	none
Mar.	none	none	none
Apr.	2,910,070	62,560	5,674,112
May	12,143,711	3,935,749	12,136,824
June	12,407,625	7,801,699	13,047,448
July	6,431,100	9,187,770	13,603,094
Aug.	222,722	8,920,039	12,704,318
Sept.	85,172	8,368,731	11,391,193
Oct.	273,344	8,043,664	10,599,773
Nov.	5,065,942	4,281,562	3,796,584
Dec.	.....	61,317	19,498

American Iron Ore Association.

Ferrous Scrap

(Gross tons)

	Exports 1959	Exports 1958	Imports 1959	Imports 1958
Jan.	197,264	305,826	15,060	16,069
Feb.	239,284	222,958	17,903	12,985
Mar.	254,356	300,070	21,141	19,800
Apr.	269,014	311,209	19,484	10,568
May	375,164	330,813	30,593	16,218
June	365,502	220,229	31,065	21,725
July	.....	175,929	.....	27,092
Aug.	.....	150,897	.....	37,122
Sept.	.....	197,074	.....	30,899
Oct.	.....	228,278	.....	44,939
Nov.	.....	201,330	.....	37,053
Dec.	.....	126,579	.....	22,039
Totals	.....	2,771,192	.....	296,509

U. S. Bureau of Mines.

Ferrous Scrap Consumption & Stocks

(Thousands of gross tons)

	Makers of Steel Ingots & Castings[1] 1959	1958	Makers of Steel Castings[2] 1959	1958	Iron Foundries & Misc. 1959	1958	Totals† 1959	1958	Consumers' Stocks‡ 1959	1958
Jan.	4,352	3,123	201	198	822	751	5,375	4,072	8,331	7,951
Feb.	4,612	2,658	211	175	835	658	5,658	3,491	8,197	7,951
Mar.	5,505	2,874	248	177	925	668	6,677	3,718	8,243	8,090
Apr.	5,410	2,616	261	164	974	649	6,645	3,429	8,276	8,249
May	5,469	3,068	256	152	918	643	6,643	3,862	8,199	8,146
June	5,132	3,600	264	151	927	658	6,322	4,409	8,215	7,863
July	n.a.	3,026	n.a.	116	n.a.	575	1,006	3,717	1,177	7,925
Aug.	n.a.	3,415	n.a.	149	n.a.	639	....	4,203	....	7,949
Sept.	n.a.	3,561	n.a.	162	n.a.	749	....	4,472	....	8,048
Oct.	n.a.	4,128	n.a.	195	n.a.	768	....	5,091	....	8,043
Nov.	....	3,900	...	167	...	737	....	4,804	....	8,303
Dec.	....	3,985	...	196	...	793	....	4,974	....	8,566

n.a.—not available because of steel strike.
[1]Includes only those castings made by companies producing steel ingots.
[2]Excludes companies that produce both steel castings and steel ingots.
†Totals are not precise because of rounded figures.
‡At end of month.
U. S. Bureau of Mines.

Coke Production

(Net tons)

	Oven	Beehive	Totals
1959*	.....	.....	53,400,000
Jan.	5,532,755	81,941	5,614,696
Feb.	5,436,617	90,197	5,526,814
Mar.	6,262,234	137,298	6,399,532
Apr.	6,074,002	152,272	6,226,274
May	6,243,859	132,912	6,376,771
June	5,923,236	120,781	6,044,017
July	2,310,106	58,728	2,368,834
Aug.	1,542,545	40,245	1,582,790
Sept.	1,532,010	31,701	1,563,711
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1958	52,915,265	566,546	53,481,811
Jan.	4,714,610	47,627	4,762,237
Feb.	4,041,122	37,445	4,078,567
Mar.	4,301,831	40,124	4,341,955
Apr.	3,802,015	34,391	3,836,406
May	3,862,390	36,439	3,898,829
June	3,889,400	44,969	3,934,369
July	3,927,718	29,388	3,957,106
Aug.	4,275,708	38,801	4,314,509
Sept.	4,450,171	55,208	4,505,379
Oct.	5,046,197	61,571	5,107,768
Nov.	5,176,712	63,779	5,240,491
Dec.	5,427,391	76,804	5,504,195

YEARLY TOTALS

	Oven	Beehive	Totals
1957	73,860,692	2,090,029	75,950,721
1956	71,992,242	2,462,022	74,454,264
1955	73,584,214	1,717,612	75,301,826

*Estimated.
U. S. Bureau of Mines.

Pig Iron

(Thousands of gross tons)

	Consumption 1959	Consumption 1958	Stocks† 1959	Stocks† 1958
Jan.	5,610	4,209	3,478	3,470
Feb.	5,628	3,552	3,296	3,458
Mar.	6,798	3,824	3,172	3,591
Apr.	6,653	3,379	3,095	3,600
May	6,868	3,692	3,118	3,502
June	6,586	4,059	3,064	3,421
July	348	3,820	772	3,439
Aug.	....	4,324	....	3,354
Sept.	....	4,525	....	3,339
Oct.	....	5,240	....	3,378
Nov.	....	5,190	....	3,466
Dec.	....	5,320	....	3,540

MONTHLY AVERAGES

Consumption		Stocks†	
1958	4,261	1958	3,464
1957	5,682	1957	2,717
1956	5,581	1956	2,055
1955	5,746	1955	2,061

†Including suppliers' stocks at end of month.
U. S. Bureau of Mines.

Refractories†

(Value of shipments—in thousands)

1959	Clay Refractories	Nonclay Refractories	Total Refractories
1st Qtr	$ 45,765	$ 65,200	$110,965
2nd Qtr	51,349	69,035	120,384
3rd Qtr	33,566	33,877	67,443
1958	162,887	216,898	379,785
1957	207,640	253,668	461,308
1956	208,608	210,102	418,710
1955	181,076	187,417	368,493

†Data do not include dead-burned magnesia and magnesite or dead-burned dolomite for 1954-56.
U. S. Bureau of the Census.

Fluorspar

(Net tons)

1959	Production	Imports	Consumption	Stocks†
1st Qtr	43,144	120,057	151,220	161,004
2nd Qtr	55,309	131,991	171,066	185,535

YEARLY TOTALS

1958	310,600	392,164	494,227	203,968
1957	322,600	631,367	644,688	245,319
1956	306,500	485,552	621,354	211,473
1955	268,400	363,420	570,261	164,016

U. S. Bureau of Mines. †End of period.

U. S. Electricity Production Capacity†

(Thousands of kilowatts)

1959			
January	143,797	July	151,527
February	144,522	August	153,673
March	145,633	September	154,515
April	146,191	October	
May	148,034	November	
June	150,222	December	

CAPACITIES AT YEAREND

1958	142,413	1954	102,592	1950	68,919
1957	129,123	1953	91,502	1949	63,100
1956	120,697	1952	82,226	1948	56,560
1955	114,472	1951	75,775	1947	52,322

†Total electric utility industry.
Edison Electric Institute.

Liquefied Petroleum Gas Consumption in Steel Industry

(Gallons)

	Heating and Annealing	All Other	Totals
1958	4,861,425	3,551,784	8,413,209
1957	8,761,323	2,537,219	11,298 542
1956	9,157,271	2,452,896	11,610,167

American Iron & Steel Institute.

ELECTRICITY OUTPUT

(Total electric utility industry)
(Millions of kilowatt-hours)

1959—By Weeks

Jan. 3	12,364	May 2	12,546	Sept. 5	13,759
Jan. 10	13,554	May 9	12,659	Sept. 12	13,109
Jan. 17	13,324	May 16	12,684	Sept. 19	12,779
Jan. 24	13,394	May 23	12,931	Sept. 26	12,878
Jan. 31	13,151	May 30	12,778	Oct. 3	13,234
Feb. 7	13,292	June 6	13,023	Oct. 10	13,086
Feb. 14	13,156	June 13	13,503	Oct. 17	12,861
Feb. 21	13,259	June 20	13,331	Oct. 24	12,762
Feb. 28	12,972	June 27	13,749	Oct. 31	12,978
Mar. 7	12,945	July 4	13,124	Nov. 7	13,019
Mar. 14	12,996	July 11	13 502	Nov. 14	13,270
Mar. 21	12,900	July 18	13,415	Nov. 21	13,812
Mar. 28	12,709	July 25	13,577	Nov. 28	13,173
Apr. 4	12,618	Aug. 1	13,775	Dec. 5	.....
Apr. 11	12,604	Aug. 8	13,675	Dec. 12	.....
Apr. 18	12,609	Aug. 15	13,648	Dec. 19	.....
Apr. 25	12,538	Aug. 22	14,003	Dec. 26	.....
		Aug. 29	14,109		

Edison Electric Institute.

YEARLY TOTALS

(Millions of kilowatt-hours)

1959*	688,000
1958	644,760
1957	631,507
1956	600,668
1955	547,038
1954	471,686
1953	442,685
1952	399,224
1951	370,673
1950	329,141
1949	291,100

*Estimated.
Federal Power Commission.

Fuel Oil Consmption in Steel Industry

(Thousands of gallons)

	Melting Furnaces	Heating, Annealing etc.	Totals
1958	998,150	609,340	1,607,490
1957	1,320,545	644,698	1,965,243
1956	1,540,835	720,794	2,261,629
1955	1,584,752	693 090	2,277,842
1954	1,239,305	558,989	1,798,294
1953	1,708,471	684,745	2,393,216
1952	1,579,960	660,165	2,240,125

American Iron & Steel Institute.

Bituminous Coal Stocks

(Industrial and retail dealers;
Thousands of net tons at end of month)

	1959	1958		1959	1958
Jan.	71,203	77,355	July	65 374	71,144
Feb.	69,167	72,264	Aug.	66,596	72,256
Mar.	65,868	70,922	Sept.	68,773	74,020
Apr.	65,739	71,296	Oct.		77,807
May	67,659	72,613	Nov.		77,212
June	70,369	74,646	Dec.		76,285

U. S. Bureau of Mines.

Natural Gas Consumption in Steel Industry

(Millions of cubic feet)

	Melting Furnaces	Heating, Annealing	All Other	Totals
1958	58,409	149,240	71,051	278,700
1957	68,029	154,440	58,665	281.134
1956	60,615	164,057	59,032	283,704
1955	57,640	163,742	52,302	273 684
1954	40,302	128,532	44,869	213,703
1953	44,765	139,339	39,794	223,898

American Iron & Steel Institute.

Bituminous Coal Consumption

(Thousands of net tons)

	Industrial Consumption 1959	Industrial Consumption 1958	Retail Deliveries 1959	Retail Deliveries 1958	Totals 1959	Totals 1958
Jan.	32,643	31,778	3,040	5,006	35,683	36,784
Feb.	29,761	28,622	3,551	5,031	33,312	33,653
Mar.	31,950	28,692	2,802	3,627	34,752	32,319
Apr.	29,291	24,932	1,634	2,198	30.925	27,130
May	29,235	24,477	1,018	1,567	30 253	26,044
June	28,862	24,199	1,059	1,451	29.921	25,650
July	24,989	24,824	1,248	1,454	26,217	26,278
Aug.	23,360	26,141	1,622	2,063	24,982	28,204
Sept.	22,463	26,647	2,281	2,826	24,744	29,473
Oct.		29,028		2,928		31,956
Nov.		29,251		2,621		31,872
Dec.		32,604		2,932		35,536

U. S. Office of Business Economics.

Monthly Averages

	Industrial Consumption	Retail Deliveries	Totals
1958	27,599	2,809	30,408
1957	31,496	2,976	34,472
1956	32,016	4,056	36,072
1955	30,866	4,418	35,284
1954	25,938	4,317	30,255
1953	30,569	4,998	35,567
1952	29,324	5,572	34,896
1951	32,877	6,198	39,075
1950	30,815	7,035	37,850

U. S. Bureau of Mines.

Natural Gas Sales

(Millions of therms)

1959	Residential	Industrial, Commercial	Other	Totals
1st Qtr	12,966	13,543	1,095	27 604
2nd Qtr	5,626	13,254	1,104	19,984
1958	26,336	47,564	3,429	77,329
1957	24,279	46,815	3,919	75,013

American Gas Association.

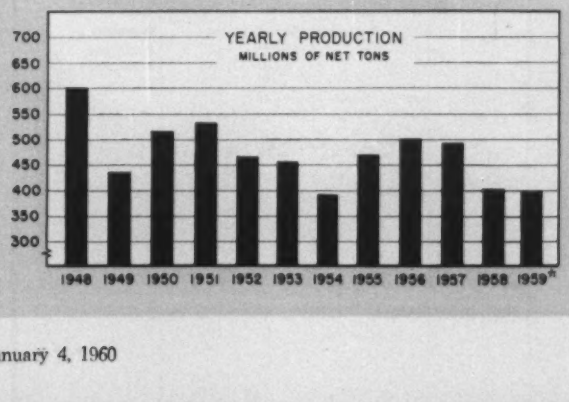
Oxygen Consumption in Steel Industry

(Millions of cubic feet)

	Purchased	Own Manufacture	Totals
1958	19,015	9,819	28,834
1957	17,106	8,781	25,887
1956	15,837	8,036	23,873

American Iron & Steel Institute.

BITUMINOUS COAL OUTPUT



1959—by Weeks

(Thousands of net tons)

Jan. 3	7,015	May 2	8,235	Sept. 5	7,340
Jan. 10	8,195	May 9	8,350	Sept. 12	6,400
Jan. 17	8,290	May 16	8,255	Sept. 19	7,780
Jan. 24	8,005	May 23	8,410	Sept. 26	7,795
Jan. 31	8,585	May 30	8,150	Oct. 3	7,600
Feb. 7	8,415	June 6	8,500	Oct. 10	7,765
Feb. 14	8,175	June 13	9,110	Oct. 17	7,975
Feb. 21	8,055	June 20	9,335	Oct. 24	8,100
Feb. 28	8,235	June 27	8,740	Oct. 31	7,935
Mar. 7	7,715	July 4	1,810	Nov. 7	7,675
Mar. 14	7,625	July 11	1,520	Nov. 14	8,860
Mar. 21	7,935	July 18	7,270	Nov. 21	9,425
Mar. 28	7,920	July 25	7,285	Nov. 28	8,055
Apr. 4	6,980	Aug. 1	7,185	Dec. 5	....
Apr. 11	7,985	Aug. 8	6,805	Dec. 12	....
Apr. 18	8,020	Aug. 15	7,225	Dec. 19	....
Apr. 25	8,095	Aug. 22	7,150	Dec. 26	....
		Aug. 29	7,320		

U. S. Bureau of Mines; National Coal Association. *Estimated.

Construction

METALWORKING FACTS AND FIGURES

Construction Contract Awards

(Valuation—thousands of dollars)

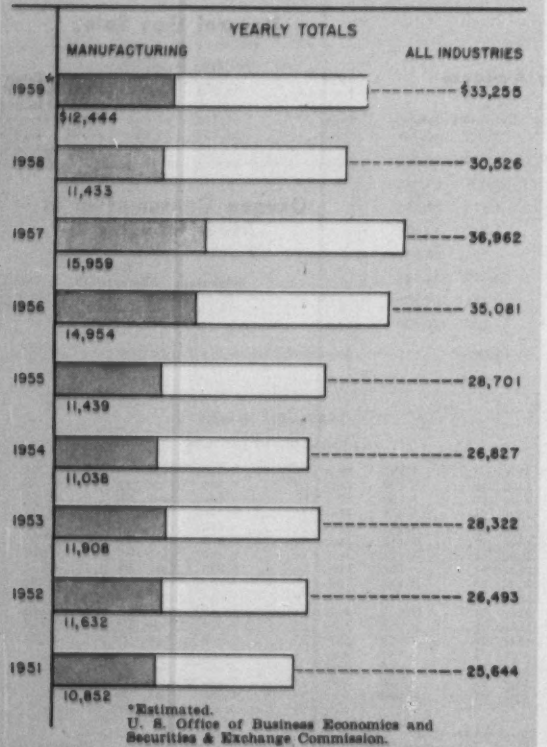
	Residential and Nonresidential		Public Works, Utilities		Totals	
	1959	1958	1959	1958	1959	1958
Jan.	1,839,741	1,536,194	479,426	529,865	2,319,167	2,066,059
Feb.	1,777,414	1,478,101	529,623	475,321	2,307,037	1,953,422
Mar.	2,453,944	2,037,658	885,990	683,570	3,339,934	2,721,228
Apr.	3,017,987	2,198,013	760,432	682,998	3,778,419	2,881,011
May	2,748,844	2,470,257	793,014	932,318	3,541,858	3,402,575
June	2,816,954	2,340,275	842,063	1,479,307	3,659,017	3,819,582
July	2,880,774	2,633,477	775,763	973,579	3,656,537	3,607,056
Aug.	2,512,325	2,529,514	571,324	937,062	3,083,649	3,466,576
Sept.	2,472,259	2,352,504	585,796	863,415	3,058,055	3,215,919
Oct.	2,518,419	2,549,834	616,090	759,190	3,134,500	3,309,024
Nov.	.....	1,980,768	.....	613,087	.....	2,593,855
Dec.	.....	1,728,567	.....	553,314	.....	2,281,881
Totals*	28,845,000	25,835,162	7,660,000	9,483,026	36,505,000	35,318,188

*Totals for 1959 estimated.
F. W. Dodge Corp.

NEW PLANT & EQUIPMENT EXPENDITURES

(Millions)

	Manufacturing		All Industries	
	1959	1958	1959	1958
1st Quarter	$2,456	$2,898	$6,905	$7,325
2nd Quarter	3,021	2,939	8,323	7,761
3rd Quarter	3,152*	2,664	8,553*	7,427
4th Quarter	3,815*	2,932	9,474*	8,013
Totals	$12,444*	$11,433	$33,255*	$30,526



*Estimated.
U. S. Office of Business Economics and Securities & Exchange Commission.

Construction Put in Place

(Valuation—millions)

	Private					Public	Totals
	Nonfarm Residential	Nonresidential	Farm	Public Utility	All Other		
1959							
Jan.	$1,471	$655	$109	$371	$14	$1,130	$3,750
Feb.	1,374	636	112	364	12	1,032	3,530
Mar.	1,562	625	124	411	13	1,127	3,862
Apr.	1,799	627	137	439	13	1,285	4,300
May	1,972	687	158	460	15	1,469	4,761
June	2,096	762	175	474	17	1,637	5,161
July	2,151	801	185	477	19	1,610	5,243
Aug.	2,135	811	189	488	19	1,649	5,291
Sept.	2,100	773	174	466	20	1,564	5,097
Oct.	2,022	n.a.	n.a.	n.a.	n.a.	1,379	4,791
Nov.	....	....	....	....	....	....	....
Dec.	....	....	....	....	....	....	....
Totals*	$22,150	$8,600	$1,750	$5,100	$200	$16,200	$54,000
1958	18,047	8,675	1,475	5,105	189	15,412	48,903
1957	17,016	9,552	1,596	5,412	204	14,016	47,796

n.a.—not available.
*Estimated.
U. S. Bureau of the Census.

New Houses Started

(Permanent nonfarm dwellings—cost estimated in thousands)

	Number		Cost	
	1959	1958	1959	1958
January	87,000	67,900	$986,589	$792,338
February	94,500	66,100	1,084,835	781,091
March	121,000	81,400	1,438,400	972,407
April	142,200	99,100	1,646,079	1,192,669
May	137,000	108,500	1,612,039	1,323,739
June	136,700	113,000	1,570,000	1,371,588
July	128,800	112,800	1,625,000	1,362,530
August	129,300	124,000	1,614,000	1,466,281
September	120,400	121,000	1,590,000	1,468,951
October	105,100	115,000	.....	1,405,196
November	.....	109,400	.....	1,298,532
December	.....	91,200	.....	1,063,708
Totals	1,325,000*	1,209,400	.....	$14,499,360

YEARLY TOTALS

	Number	Cost		Number	Cost
1959	1,325,000	.....	1955	1,328,900	$14,544,647
1958	1,209,400	$14,499,360	1954	1,220,440	12,478,237
1957	1,041,900	12,693,995	1953	1,103,800	10,488,003
1956	1,118,100	13,077,027	1952	1,127,000	10,208,983

U. S. Bureau of the Census. *Estimated.

Fabricated Structural Steel

(Tons)

	Orders Placed			Shipments		
	1959	1958	1957	1959	1958	1957
January	235,784	162,158	320,408	224,260	316,742	290,076
February	294,367	185,646	294,141	216,127	282,576	318,971
March	254,773	195,970	318,935	260,490	336,598	342,451
April	294,806	208,161	403,576	290,623	323,574	362,192
May	241,612	224,308	331,227	294,127	328,180	377,304
June	290,911	286,798	247,152	365,434	329,240	384,724
July	259,131	330,890	213,175	238,559	290,856	342,486
August	196,985	225,768	183,520	220,420	298,012	383,785
September	284,114	255,584	221,043	182,596	313,701	338,629
October	244,060	259,016	181,337	195,313	307,080	384,797
November	.....	242,635	217,959	.....	271,088	334,083
December	.....	196,510	140,706	.....	266,600	320,210
Totals	.....	2,773,444	3,073,179	.....	3,664,247	4,179,708

	Orders Placed	Shipments
1956	4,736,170	3,780,101
1955	4,651,312	3,659,353

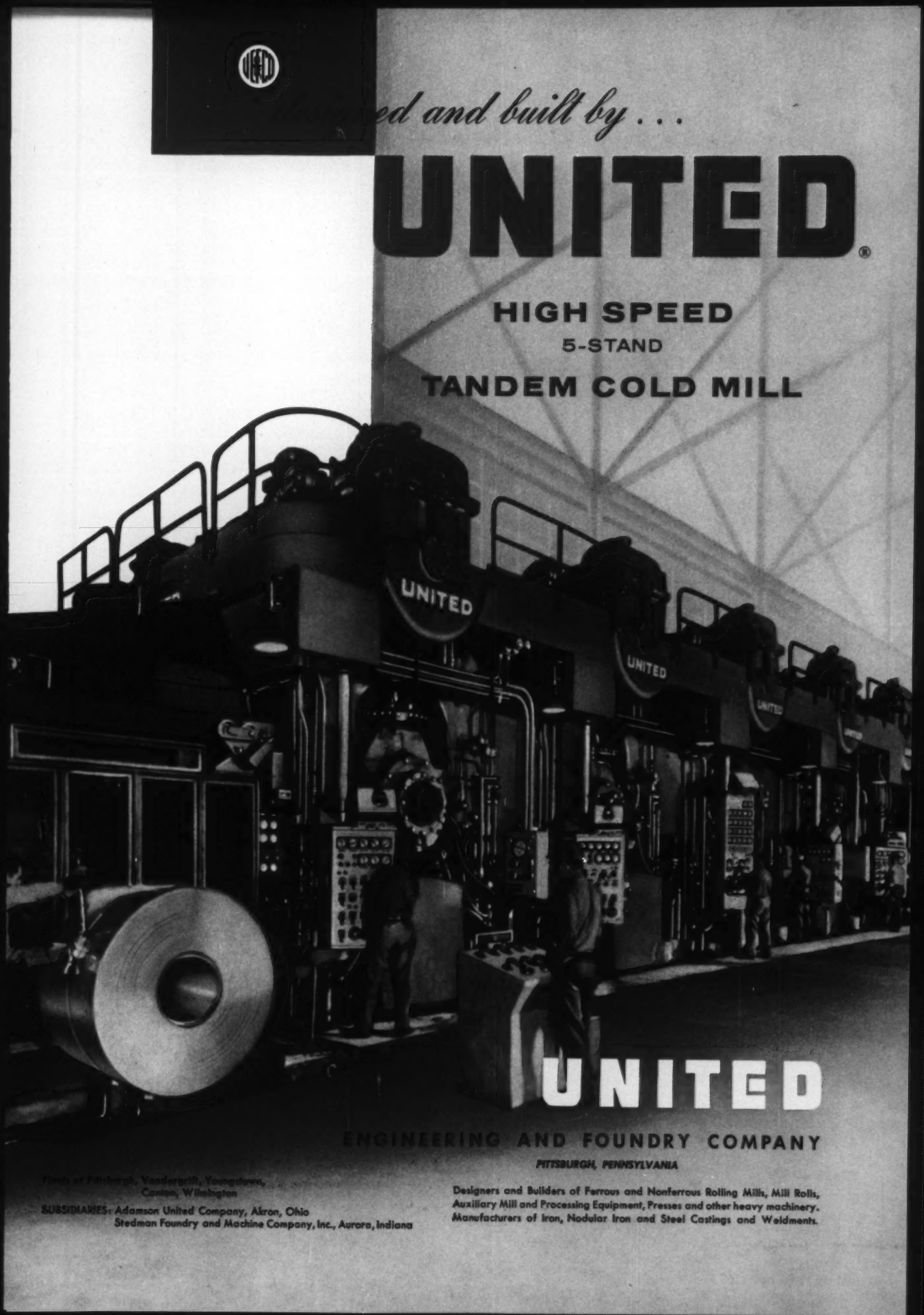
American Institute of Steel Construction.

Construction Costs

(1947-49=100)

	1959	1958	1957		1959	1958	1957
Jan.	139	137	134	July	142	139	138
Feb.	140	137	135	Aug.	142	139	138
Mar.	140	137	135	Sept.	143	139	138
Apr.	140	138	135	Oct.	...	139	138
May	141	138	137	Nov.	...	139	138
June	142	139	137	Dec.	...	139	139

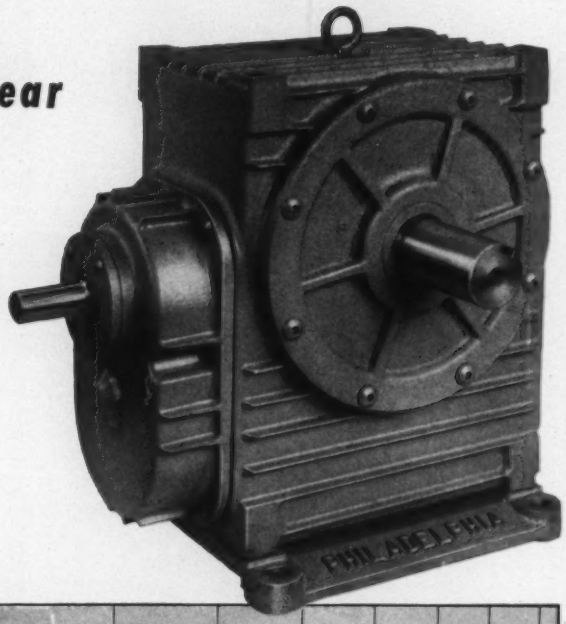
U. S. Department of Commerce composite.


ed and built by . . .
UNITED®
HIGH SPEED
5-STAND
TANDEM COLD MILL
UNITED
UNITED
UNITED
UNITED
ENGINEERING AND FOUNDRY COMPANY
PITTSBURGH, PENNSYLVANIA
Plants at Pittsburgh, Vandergrift, Youngstown, Canton, Wilmington
SUBSIDIARIES: Adamson United Company, Akron, Ohio
Stedman Foundry and Machine Company, Inc., Aurora, Indiana
Designers and Builders of Ferrous and Nonferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

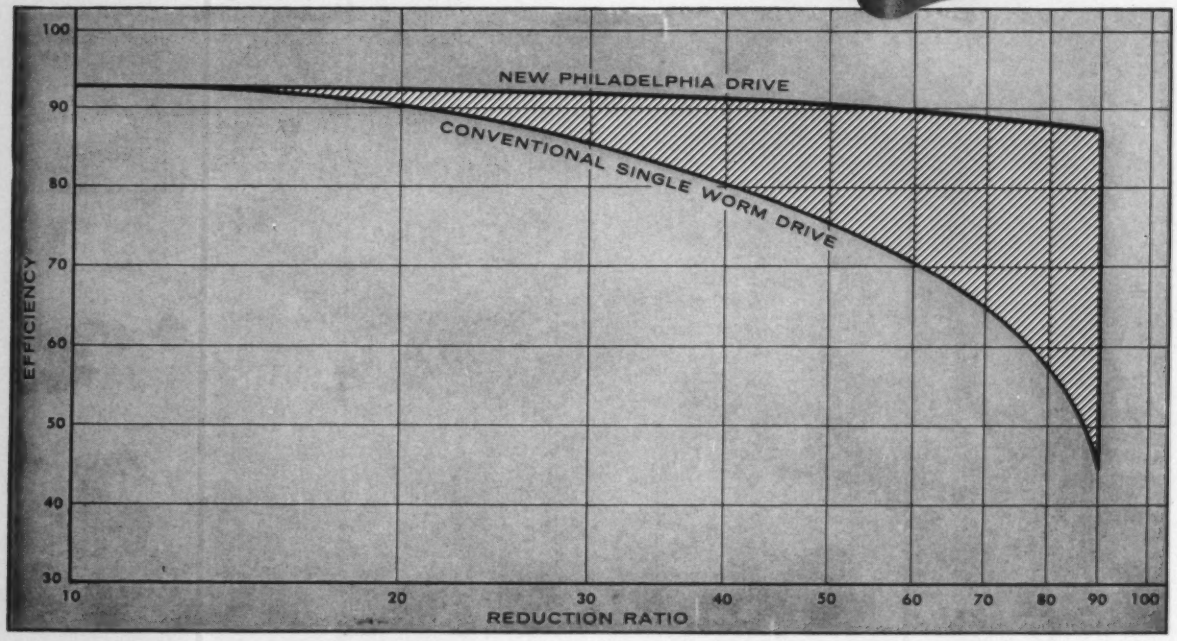
NEW...from Philadelphia Gear

HIGH EFFICIENCY WORM GEAR REDUCERS

Now you can get increased efficiency in worm gear drives —see curve. Helical attachments for double and triple reduction units combine the efficiency advantage of helical gearing with the high ratio advantage of worm gearing. You save on power consumption . . . high operating temperatures will never be a problem.



Shaded area shows gain in power consumption



New flexibility. One basic housing design plus standardized mounting bases, gearing, helical attachments and torque control attachments permit fast assembly from stock. You can get *any* drive arrangement, *any* mounting arrangement, in the exact size and ratio to meet your specific requirements. Torque control attachments for all sizes are available from stock for applications demanding overload protection.

New high capacity. This is not just a re-rated line. Improved tooth forms, precision ground alloy steel worms, special high strength bronze gears, sturdy housings, helical attachments with ground gearing . . . all mean higher capacity in less space. In fact, you get space savings to 50% . . . weight savings to 60%. Ratios from 5⅛: 1 to 1212: 1. Center distances from 3″ to 21″. Write for catalog data today.

philadelphia gear drives

PHILADELPHIA GEAR CORPORATION

Erie Avenue and G Street • Philadelphia 34, Pennsylvania

Offices in all Principal Cities • Virginia Gear & Machine Corp., Lynchburg, Va.

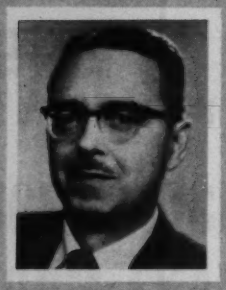
INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

1960 FORUM

TECHNICAL PROGRESS

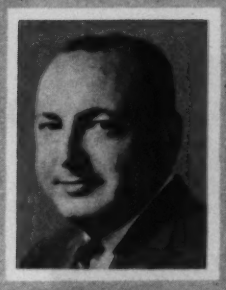
This annual feature gives busy managers a rare opportunity to catch up with the latest thinking in 15 vital areas of metalworking and steelmaking. It's the type of forward looking information that will help you plan for the soaring sixties. STEEL's forum this year offers the comments of 278 authorities. You'll find the categories on these pages:

STEELMAKING 188
NONFERROUS METAL PRODUCTION . . 206
CASTING 216
MATERIALS AND METALLURGY 228
HEAT TREATING 236
INSPECTION AND TESTING 247
DRIVES AND CONTROLS 253
MACHINING 260
TOOLING AND GAGING 275
FORMING 280
CLEANING AND FINISHING 286
JOINING AND ASSEMBLY 298
HANDLING AND PACKAGING 306
LUBRICATION 321
SERVICE AND MAINTENANCE 331

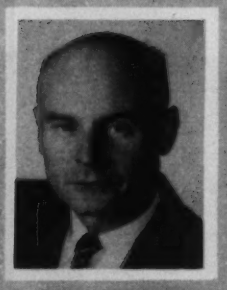


RALPH M. TRENT
President
Pangborn Corp.
Hagerstown, Md.

A. G. FORREST
Assistant to Chief Metallurgist
Republic Steel Corp.
Cleveland

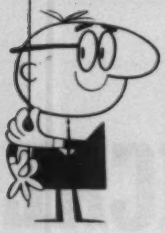


F. B. O'MARA
Marketing Manager, Electrode Products
National Carbon Co., a div. of
Union Carbide Corp., New York



J. R. LeCRON
Metallurgical Engineer
Bethlehem Steel Co.
Bethlehem, Pa.

1960 FORUM ON TECHNICAL PROGRESS



Steelmaking

Abrasive Descaling Equipment To Gain Users in Sixties

Ralph M. Trent—Centrifugal abrasive descaling installations will continue to replace less efficient processes in steel plants during the sixties.

Versatility in machine design and development of high quality steel abrasives will make for lower processing costs and boost potential profit. Wherever rolling scale, forging scale, or heat treat scale has been encountered, effective blast cleaning methods have been developed.

Vacuum Melting, Degassing Studied for Common Steels

A. G. Forrest—The technology of vacuum melting and degassing will be further developed in the next few years. Steelmen will want to learn what effect the processes (or modifications of them) have on the metallurgical properties of commonly used alloy and carbon grades.

In recent years, recognition of the effects of small quantities of gases in steel and the need for a more homogeneous ingot have led to development of several vacuum melting processes and ladle or stream degassing of open hearth and electric furnace alloy steels.

Steels so produced are more resistant to flaking or rupturing during cooling, especially in large sections, than air melted metals. Transverse ductility has been improved at high strength levels. Nonmetallics are generally smaller and more uniformly distributed. Segregation is reduced, and the metal is more homogeneous.

Better Melting Practices Up Electric Steel Output

F. B. O'Mara—The proper combination of the following techniques may lead to outputs of 60 to 70 tons an hour from large electric furnaces:

- Electric furnace operators may increase production 15 to 20 per cent by using oxy-gas burners to speed scrap meltdown. They'll realize a relative reduction in power and electrode consumption. Production tests of door and wall burners confirm the figures and indicate more uniform melting. This important development is but another in the chain of technological advances that are making the electric furnace more competitive.
- Capacities of present electric furnaces can be upped even more through hot metal charging and use of higher input power. Output can also be increased by careful attention to shop, scrap bay, and scrapyard layout; scrap classification; proper handling and assembly of electrodes.

Looks for Increasing Use Of Material Standards

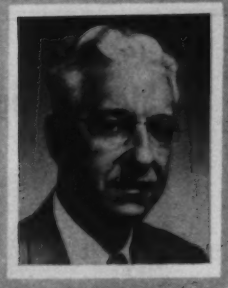
J. R. LeCron—Makers of steel products and their customers will make more use of material specifications published by technical societies.

Specification writing bodies (like the American Society for Testing Materials or the American Petroluem Institute) are composed of producers and consumers, and the standards they publish reflect the viewpoints of both groups. To the consumer, they mean lower cost material, better availability, and uniformity of product. To the steel producer, it means the elimination of vague and restrictive requirements that serve no purpose and the standardization of cost reducing mill practices.

PHILIP S. SAVAGE
Consultant
Donner Hanna Coke Corp.
Buffalo

MERRILL COX
Vice President
Arthur G. McKee & Co.
Cleveland

WALTER M. PATTERSON
Electric Melting Consultant
Allegheny Ludlum Steel Corp.
Pittsburgh



M. W. LIGHTNER
Vice President, Applied Research
Research & Technology Div.
U. S. Steel Corp., Pittsburgh

The co-operation of societies has led to wider use of specifications. Example: Specifications for materials in Section II of the American Society of Mechanical Engineers Boiler & Pressure Vessel Code are identical, or similar to, those of the American Society for Testing Materials. The federal government also recognizes the specifications published by technical societies. It has promoted the use of ASTM standards as a replacement for similar government documents.

Coke Oven Building Repair Expected to Boom in Sixties

Philip S. Savage—Coke oven builders and contractors who specialize in repairs should be busy for the next few years.

Slow operating rates during 1958 and the long strike of 1959 did serious damage to older ovens. It means that repair bills will be heavier in 1960. And ovens that were to be replaced in the next five years will have to be replaced sooner.

Metallurgical coke producers should build their ovens as economically as possible in the sixties, putting all their emphasis on the production of high grade coke, rather than coal chemicals.

Production of chemicals by the petrochemical industry is already greater than that of the domestic coking industry.

Except for the tar (and in some cases gas) coal byproducts cannot be recovered at a profit if the capital cost of recovery and refining equipment is considered. Even petrochemical naphthalene seems about to enter the chemical field in large volume.

Conventional Steelmaking To Stay Popular in Sixties

Merrill Cox—Most new developments in steelmaking processes and equipment will be in raw material preparation and iron ore reduction. Interest will continue in so called direct reduction processes (more properly called synthetic scrapmaking processes). But in the next few years, only blast furnaces will be installed for large tonnage iron production.

Further production increases and lower coke rates can be realized by injecting hydrocarbon gases into the furnace, at or near the tuyere zone. Such practice will require higher blast temperatures. Obtaining those temperatures (2000° F or higher) is a problem for engineers.

Several L-D plants are in operation and several are under construction. But the open hearth continues to improve in production and economy. Increased use of oxygen in the open hearth makes it more competitive with the L-D process. And the open hearth offers more flexibility in the amount of scrap charged.

Several large deposits of specular hematite are being mined, and others are being explored. Some say the material should be sintered at the steel plant while others say it should be pelletized at the mines. In mid-1960, a plant using the grate-kiln process will go into operation. It may help to resolve the sinter-pellet problem.

Technical Improvement Needed In American Steel Industry

Walter M. Patterson—The American steel industry must exploit every means to improve if it is to compete favorably in its own markets with foreign producers.

It must look constantly at the economic factors in its processes—raw materials, labor, production operation, yield, and quality control.

Oxygen steelmaking, vacuum melting, and vacuum casting will be the exciting features of the steel industry for the next several years.

Relatively soon, much higher temperatures will be used in metallurgy. The first phase of that transition is made possible by the further improvement of refractories. Basic refractory brick and electrocast refractories are a start. But more progress must be made.

A recent development that is helpful to the melter is the expendable tip immersion thermocouple. It was quickly accepted because it took most of the doubt out of molten metal temperature measurements. The expendable tip couple determines temperatures faster, and if the bath is uniform, will always give reproducible results.

Smoke and fume control is one of steel's big problems. Effective, economical control and cleaning of effluent is a big job. Tighter regulations and ways to meet them will undoubtedly evolve in the next five years.

Vacuum Melting and Casting To Set Pace in Technology

M. W. Lightner—Many changes will be made in steelmaking methods in the next few years.

Vacuum melting and casting techniques will get increased attention from steel producers and users. Research on several casting methods that may produce sections essentially free from surface defects will be expanded.

Blast furnace productivity will continue to increase as burdens are upgraded. New facilities will be built to produce agglomerates. Over half the ore burden may soon be sinter or pellets; the remainder will be screened ore. Economics of sized sinter and pellets will be studied. Many sinter plants are adding limestone or dolomite to the mix to produce self-fluxing or burden fluxing sinter. That helps to boost blast furnace production and lower coke rates.

Improved stove design and programed automatic controls for higher blast temperatures will permit higher blowing rates.

Completion of new oxygen plants and availability of natural gas will allow tests to be made on natural gas injection in

Steelmaking

J. O. STEPHENS
Section Manager
Industrial Gas Turbine Dept.
Westinghouse Electric Corp.
Lester, Pa.

NORMAN P. GOSS
Consultant
Cleveland

GEORGE E. KOPETZ
Vice President & General Manager
Blaw-Knox Co.
Pittsburgh

the tuyeres and on oxygen enriched blast in furnaces burdened with almost 100 per cent self-fluxing sinter.

Basic oxygen steelmaking will continue to gain, especially where open hearth facilities are obsolete, or where steelmaking capacity is to be increased.

The basic oxygen process is suitable for production of steels with less than 0.10 per cent carbon. The steels constitute about 40 per cent of total production. It will be interesting to see if the process can be used to make intermediate high carbon steels and constructional alloy steels.

The all basic open hearth furnace demonstrated its superiority over the silica roof furnace in 1959. About 20 per cent of all American open hearths are equipped with basic roofs, and the trend to basic is expected to continue at an even faster pace. Basic roofs permit increases in furnace productivity through the use of oxygen roof lances and higher firing rates. Developments needed: Faster furnace charging, fast analytical methods, and continuous or automatic means for measuring the bath temperature.

Turbine to Boost Efficiency In Blast Furnace Blowing

J. O. Stephens—The steel industry will continue to depend on blast furnaces for high tonnage iron production. And steelmakers will continue to look for ways to make the stacks more efficient.

Our company has completed shop tests on a gas turbine that will be used for blast furnace blowing at South Works, United States Steel Corp., Chicago. It will run on blast furnace gas and provide blast air at 125,000 cfm. The turbine costs about 25 per cent less than other available blowing equipment and offers a 10 per cent efficiency boost.

The unit should find application in other steelmaking areas. Example: It may produce compressed air for oxygen generation.

New Techniques, Processes To Spark Progress in Sixties

Norman P. Goss—Steelmaking technology will gain on all fronts in the sixties.

A less expensive method is needed for producing pig iron. Many processes have been developed to reduce iron ore directly to iron, but none is entirely commercial. That keeps the blast furnace on top for the time being, in spite of its high cost.

But iron ore, lime, and coal could be mixed and processed by one of several methods already developed. The charge would be carburized and melted at 2350° F. Silicon would be removed in a rotary reactor; partially decarburized iron would be fed continuously into an electric furnace, at about 1 ton per minute. As charge filled the electric, it would be superheated and scrap could be added as required. Oxygen gas would help complete decarburization. Such a system would make electric melting competitive with other processes; it could supply finished steel in a nearly continuous flow.

If continuous casting is perfected in the next two or three years, it is likely to be applied in fully integrated plants which are close to the market and competing with conventional tonnage facilities. When that happens, electric furnaces will predominate in fully automated plants because of their flexibility and close control of chemical analysis.

Use of oxygen in blast furnaces, open hearths, and electrics will continue to increase. It offers production increases without the addition of new equipment.

In new construction, the trend will be toward top blown oxygen converters. Open hearths use more scrap, but oxygen converters cost less to install.

The need for metals with better physical properties is increasing. Hydrogen, sulfur, and other impurities must be removed. Vacuum melting and casting will be used more extensively in the next three years. They give metals better fatigue strength.

Steel Industry Technology To Get Big Boost in 1960

George E. Kopetz—The steel industry has profited from technological improvements in the last decade. The trend will continue this year and in the sixties, as proved techniques gain wider acceptance and as solutions are found for old problems.

Oxygen steelmaking will have great impact on the industry in the coming years. Top-blown oxygen converters are an important technological breakthrough; they require less investment, but produce lower cost steel than open hearths. Plans for several new oxygen converter installations have been announced.

Oxygen, used recently in open hearth furnaces, has increased capacity and decreased operating costs. In many cases, the full potential of oxygen lancing hasn't been realized because capacity of auxiliary equipment (such as scrap charging machines) didn't match that of the open hearths. Heavy investment in present open hearth facilities makes it unattractive to replace them with oxygen converters, so better auxiliaries, with larger capacities, are needed to make the furnaces more competitive.

Blast furnace perrformance will continue to improve with increased use of oxygen for blast enrichment. But perhaps more important is the possible installation of units for direct reduction of iron ore. Some processes now available require hydrogen, which must be available at the point of use for less than 40 cents per 1000 cu ft to make direct ore reduction economical.

Meanwhile, some installations will be made to reduce ore that's far from supplies of metallurgical coke but close to inexpensive natural gas for hydrogen production.

Chemical engineering is improving operations and reducing costs in the steel industry. Example: BTX refining offers

product purities comparable to those of petroleum derivatives. Ammonia is produced synthetically with hydrogen recovered from coke oven gas. But that hydrogen is still too expensive for direct ore reduction. Chemical engineering techniques will also help the industry meet more rigorous antipollution requirements. A process for treating waste pickle liquor is already technically established.

Oxygen Steelmaking Methods To Gain Popularity in 1960

John K. Stewart—Adoption of oxygen steelmaking techniques by the nation's steel industry will continue. In the two month period prior to the 1959 steel strike, our company was awarded contracts for four oxygen plants with a total capacity of more than 1700 tons per day. They will produce more than half as much oxygen as the whole steel industry used in 1958.

Three of the plants will supply open hearths. The other will provide oxygen for a large, new oxygen converter steel plant, the second such facility to be built by Jones & Laughlin Steel Corp.

Improvements in oxygen converter practice will give the process greater flexibility. A method under development will enable converters to melt much larger quantities of scrap than is now possible.

Completion of a new, 650-ton-per-day oxygen plant at Weirton Steel Co. will boost the company's monthly output to 850 million cu ft. That's more than any other steel plant produces. Consumption rate: More than 2800 cu ft of oxygen per ingot ton of steel, or almost ten times the industry average.

Steelmakers Must Automate To Meet Foreign Competition

Harry W. McQuaid—Automation must be applied in the steel industry on a scale never dreamed of. Continuous steelmaking, from ore to finished billets, slabs, bars, and rods must be practiced. That will increase volume and lower costs to meet foreign competition. Improved technology, lower labor and fixed charges in the foreign steel industry will offset any advantages our industry had because of large capacity and market volume.

When our country was spreading rapidly in area and population, and raw materials for steel production were close to transportation, the building of railroads (and later automobiles) created an increasing market for steel. That market was further developed by farm implement, military, and construction needs.

A new day is dawning. Our technical and economic leadership in steelmaking is rapidly disappearing; competition with foreign steelmakers will be difficult to meet, even in our own markets.

Because of the progress we have already made in the development of high tonnage continuous strip and bar and rod mills, the important application of automation will have to come with the treatment of ore, the making of gray iron, hot metal, and the making and rolling of steel ingots. In those fields, foreign steel producers seem to be out in front.

Needed: Automatic ore concentration and ore melting and reduction in horizontal, continuous furnaces that use oxygen enriched blast, gas or oil fuel, and powdered coal for reduction. Continuous desiliconizing and desulfurizing equipment, of tonnage capacity, is available.

Efficiency of Blast Furnaces Continues Climb with Sinter

Harold E. Rowen—Controlled sinter is coming into the spotlight. On the way: Higher reducibility and better gas-solid contact in the stacks. Fluxing agents are being sintered into the charge before it goes to the furnace. The practice will continue as the true values of intimate grain-to-grain contact become more apparent.

For many years, sinter was used only to cut down flue dust losses from blast furnaces. Later, it permitted fine ores to be used without increasing flue dust.

The long accepted practice of layering lump ore with a minimum of fines, large, expensive, metallurgical coke, and lump stone may give way to use of a more homogeneous charge as sintering and pelletizing capacities increase. The operator with a high tonnage of sinter at his command can distribute coarse and fine fractions for better control of gas flow in the stack. That's especially true if the sinter contains almost everything required except coke (and that may also be included in beneficiated fines before too long).

Older furnaces, designed for lump and soft lake ores, have handled burdens of sinter and pellets without too much protest; they are producing more hot metal and showing a lower coke rate. But part of the stack height may no longer be necessary. A major part of charge preparation is handled by greater sinter capacities. Shorter stacks may appear as furnaces are designed for 100 per cent sinter. With lower load bearing requirements, coking cost may be reduced.

Screening provided enough coke breeze for early sintering operations; but the larger number of sintering plants in operation often makes it necessary to grind expensive coke to provide enough fuel. An answer to that problem is on the way from our laboratories. Fuel of high reactivity can be made, wherever coal is available, less expensively than furnace coke.

Steelmaking

JOHN K. STEWART
General Sales Manager
Air Products Inc.
Allentown, Pa.

HARRY W. McQUAID
Consultant
Cleveland

HAROLD E. ROWEN
Vice President
McDowell Co. Inc., Cleveland

Several so-called direct reduction systems have been introduced. Many will be a source of artificial scrap; some may produce hot metal. Other processes may be announced this year, to make hot metal available to the smaller user at costs highly competitive with the giant blast furnace production rates. The processes probably won't replace the blast furnace, but they may be its companion in many areas where a single furnace cannot economically survive. Iron will be produced.

Steelmaking

C. A. SMITH
Vice President
Refractories & Chemicals Div.
Kaiser Aluminum & Chemical Corp.
Oakland, Calif.

LEO F. REINARTZ
Consultant
Armco Steel Corp.
Middletown, Ohio

P. J. WOODING
Manager, Vacuum Furnace Dept.
Lectromelt Furnace Div.
McGraw-Edison Co.
Pittsburgh

in tons per hour instead of tons per shift; analysis changes also will be faster.

Competition to Spur Research In Refractories Industry

C. A. Smith—The refractories industry is entering a more competitive era, which will force producers to put greater emphasis on research.

In the immediate future, more progress will be made in developing the all-basic open hearth furnace. Basic roofs are a good start—they have improved furnace performance. New refractory compositions and new construction methods are being developed. Considerable improvement can be expected in the performance of roof refractories (up to 50 per cent) in the next few years.

Hydration resistance of basic refractories has been improved in the last few years. More progress should be made in the near future.

Experience gained in developing basic open hearth roofs may help improve the service obtained from bricks. In many operations, silica will continue to be the most economical material, especially if its performance can be improved.

Refractories for aluminum melting will be improved. Progress has been made in the last few years in the development of long lasting refractories for remelt furnaces. Important developments can be expected in superduty refractories, including burned products, plastics, and ramming mixes.

Each year steelmen learn more about the special performance required of refractories in basic oxygen vessels. Big problem: Development of refractories that give good performance but can be shipped and stored without excessive hydration. Major developments may be announced this year.

Many Changes Are in Store For Steelmaking in Sixties

Leo F. Reinartz—Modern technology, operating ingenuity, efficiency and hard work will boost production of pig iron and steel ingots in the U. S. in the sixties.

Investigations and experiments are being made to determine the economic value of direct reduction processes, but modern blast furnace practice is still the most economical way to reduce large tonnages of iron ore.

Direct reduction processes may be tried commercially in the next few years, where it's necessary or desirable to conserve capital; where high iron tonnages aren't required and where natural gas and electric power are less expensive than coke. Such processes may supplement large plant operation, or they may be in small steel plants in areas far from steel centers.

Steel management will make every effort to increase blast furnace iron production and decrease costs. Iron ore beneficiation and bedding, limestone sizing, and coke improvement will help upgrade the burden.

Blast temperatures will be drastically increased. Stoves may be heated to higher temperatures through the enrichment of blast furnace gas with coke or natural gas. Another possibility: Add stoves, or increase the height of present ones.

Oxygen will be introduced at the blower; some natural gas may be added above the bosh. Moisture in the blast will be increased, and higher top pressures will be used. Facilities must be expanded to move more raw materials into the furnace and to tap more slag and hot metal from it. Some present blast furnaces may produce 3000 tons a day in the near future. Even higher daily tonnages can be expected from furnaces being designed.

Steel management will continue to demand better silica brick and basic brick with less tendency to spall.

Many all-basic roofs have been installed —some are of suspended arch design, others with suspended flat roof design. Some companies are going to all-basic furnace designs, and others are capping checkers with basic brick.

Steel plants are demanding increased tonnages of low cost oxygen for use in blast furnaces, open hearths, electric furnaces, and L-D converters.

Many more oxygen producing plants will be built in the next ten years to serve steel mills.

Vacuum Steelmaking Processes To Gain Popularity in 1960

P. J. Wooding—Vacuum arc melting will continue to move into the low alloy field; ladle vacuum treatment will gain industry-wide popularity.

Until the middle of 1958, vacuum arc melting was used as a production method only for the reactive and refractory metals and superalloys. As more capacity was installed and many equipment improvements made, the process became inexpensive enough to apply to a wide range of low alloy steels. Higher tonnages of tool, die, bearing, aircraft structural, and forging steels are being sold; the trend will continue in 1960. More steel users are recognizing the economy of paying a little more for much higher quality.

Long term requirements in the low alloy field could double or triple installed capacity in the next few years. A number of major vacuum arc furnace installations will be completed in 1960; more are in the planning stage for early 1961. Most of the units will produce ingots 30 in. or more in diameter. Commitments include two 40 in. furnaces.

Problem as ingot diameters increase: How to increase melting rates proportionately. The difficulty isn't in the application of power to the arc but removal of heat from the ingot. Researchers are studying the problem.

Vacuum degassing was regarded in this country as a process applicable only to electric furnace forging grades in early 1959. The treatment was used mainly to eliminate hydrogen flakes from large

(*Continued on Page* 196)

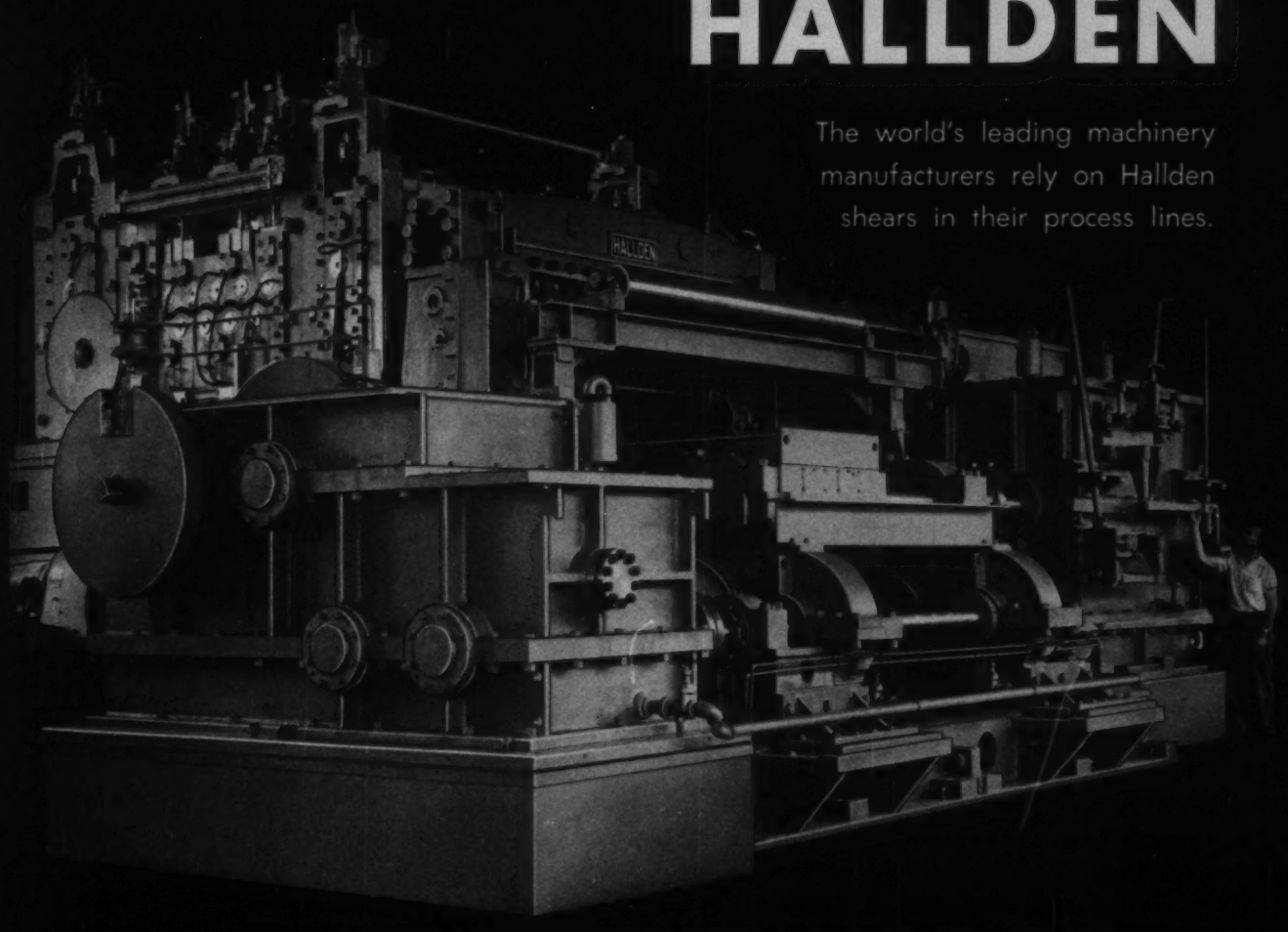
550,000 POUNDS OF PRECISION

The Guillotine Shear's superior cut on heavy gauges, synchronized on the fly

Another Hallden First — type 76 Guillotine Flying Shear, the world's largest, for continuous strip shearing — up to 5/8" thick, 100" wide aluminum — at ***two cuts per second.*** This new Hallden installation can cut mild steel up to 3/8" thick and 90" wide, with cut lengths infinitely variable up to 48 feet. Change of cut length and synchronization may be made while the Shear is in operation. For every high-production shearing application consult the shearing specialists.

HALLDEN

The world's leading machinery manufacturers rely on Hallden shears in their process lines.

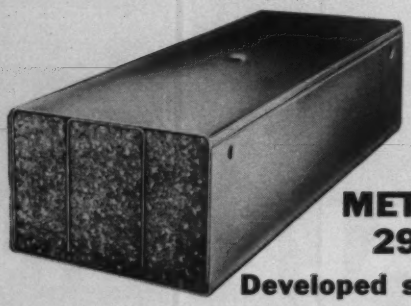


THE HALLDEN MACHINE COMPANY • THOMASTON, CONNECTICUT

Associates: The W. H. A. Robertson & Co., Ltd., Bedford, England

Steel-making HARBISON-WALKER BASIC

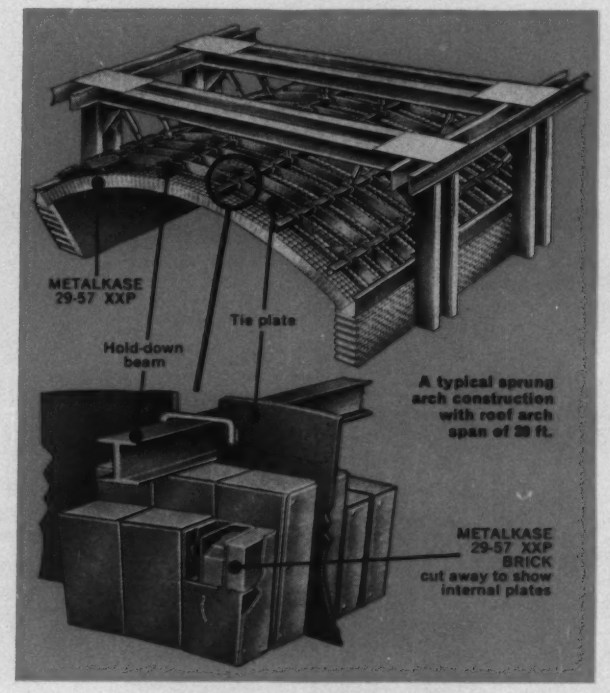
Deviation from the conventional with Harbison-Walker specialized basic refractories is necessary to lead the way to reality in the commercial accomplishment of the ALL-INCLUSIVE, ALL-BASIC open hearth steel furnace. These products most economically withstand the ever-increasing severity of operating conditions including higher temperatures and larger furnaces with greater rates of production, accomplished by the use of oxygen with its important benefits.



METALKASE 29-57 XXP

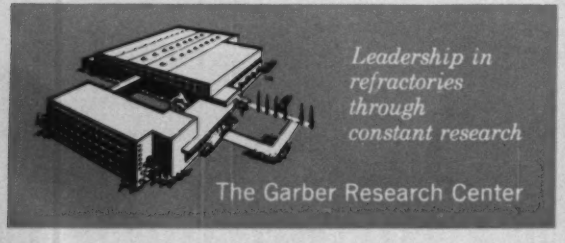
Developed specifically for service in the open hearth furnace roof.

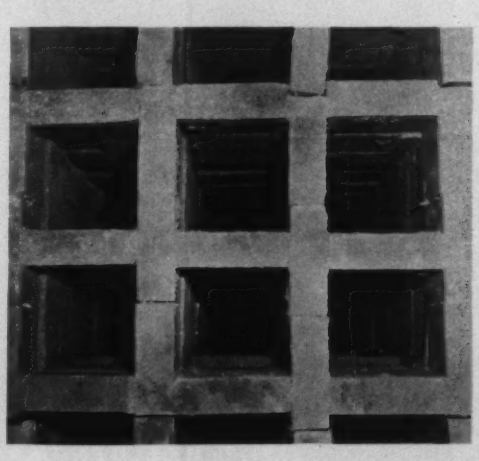
METALKASE 29-57 XXP internally plated metal-encased brick, used in both sprung and suspended arch constructions of all designs, continues making service records at many steel plants. The high purity magnesia, produced by Harbison-Walker from Michigan brines and stabilized as dense periclase, is a major constituent which measurably enhances the desirable properties of this refractory.



FORSTERITE L CHECKERS

Forsterite L is best among basic refractories for checker settings of open hearth regenerators. Properties of particular merit for this application are: resistance to fluxing, volume stability and strength at high temperatures, and relatively great heat capacity.





achievements with REFRACTORIES

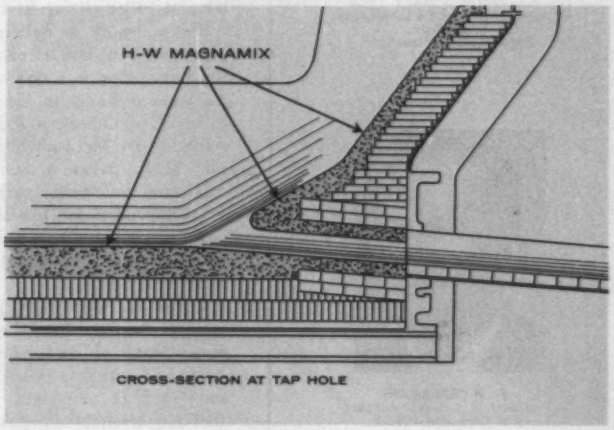
Widely-used basic refractories which are important contributors to the success of the all-basic furnace are briefly enumerated:

METALKASE, the original chemically-bonded magnesite chrome brick, steel-encased on four sides, gives superior service in front walls.

CHROMEX B is a chrome-magnesite brick having excellent volume stability and great high-temperature strength resulting from extremely hard firing. It is used with special benefit for front walls, back walls and suspended sections of the port ends.

H-W C-MIX (high purity seawater periclase) used for contour-rammed open hearth and electric furnace bottoms, greatly reduces furnace downtime, saves labor and avoids burning-in sacrifice of refractory superstructure.

H-W PERIKLASE is an exceedingly hard-fired high-magnesia brick consisting predominantly of the mineral periclase in the most stable crystalline form. It is unusually resistant to hydration and is particularly adapted for open hearth sub-bottoms.



H-W MAGNAMIX, a pioneer among high-magnesia ramming mixtures, is used for monolithic bottoms. It is especially suited for both hot and cold maintenance and for repiping tap holes.

IN BASIC OXYGEN FURNACES, HARBISON-WALKER unique basic refractories set production records

H-W 17-56 is the special tar bonded basic brick which forms the complete working linings of these oxygen vessels.

H-W AMC magnesite brick laid with strong-setting H-W PERIKLASE BONDING MORTAR forms the protective lining against the shell.

H-W OXIMIX is the basic ramming mix which forms both the monolithic hearth of the furnace and the intermediate monolith between the H-W 17-56 working lining and the H-W AMC magnesite brick.

The wide preference for these refractories is attributable to their high tonnage records, which continue to increase, with resultant reduced costs per ton of steel.

HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES **GENERAL OFFICES: PITTSBURGH 22, PENNA.**
World's Most Complete Refractories Service

Steelmaking

PHILIP J. BERG
Manager, Engineering & Construction
Sales Dept.
Dravo Corp., Pittsburgh

P. W. BAKARIAN
President & General Manager
R-N Corp., New York

F. M. RICH
Vice President, Steel Mfg.
Inland Steel Co.
Chicago

(*Concluded from Page* 192)

and medium size forgings. While several American stream degassing installations were being made for that purpose, Dortmund-Horder Huttenunion was developing a different process in Germany.

Batches of liquid steel are forced into a vacuum vessel by atmospheric pressure. After degassing, each batch leaves the vessel with considerable kinetic energy and mixes completely with the steel in the ladle. The process offers effective gas removal and thorough mixing; it permits accurate control of final chemistry. Gas removed from the steel is analyzed continuously. The analysis is recorded. That means the oxygen content of the heat is known throughout the treatment. Precise quantities of alloys can be added under vacuum from bins on top of the vessel.

Higher Blast Furnace Tonnage Sought with Sinter Pellets

Philip J. Berg—Several major steel companies are planning to boost the output of blast furnaces by using self-fluxing sinter and pelletized ore as burden.

Our company is building three sinter plants with an annual capacity of 4 million tons. One is a 6500-ton-a-day plant for Jones & Laughlin Steel Corp. at Aliquippa, Pa. Others: A 2000-ton-a-day installation for McLouth Steel Corp., Trenton, Mich. (where a similar plant was completed two years ago); and a 3360-ton-a-day plant for Interlake Iron Corp., Chicago. Some sinter plant facilities are being upgraded with sinter coolers and hot screening facilities.

Interest in pelletizing is being stimulated by the trend toward use of low-grade ores. Many of the ores must be finely ground (to upgrade them). In that form they can't be economically sintered, and they aren't suitable for direct blast furnace charging. Iron tonnage from pelletized ore compares favorably with that produced from sinter.

Rotary Kiln Direct Reduction Is Ready for Commercial Use

P. W. Bakarian—Interest and activity in the direct reduction of iron ores are greater than ever before. And rotary kiln iron production has about the same commercial status as that held by oxygen steelmaking a few years ago when the first commercial oxygen units were installed in this country. As iron demand increases, the need for new iron producing installations grows.

The domestic pattern for increasing iron capacity has been to modify, adapt, and add to blast furnace combinations; that trend continues. Installations for balling, sintering, self-fluxing, hotter blast, higher top pressure, and better coke or byproduct recovery have been economically necessary. But those additions and revisions are increasing steelmaking costs and forcing management to invest more capital in present installations.

Low capital cost of the rotary kiln, direct reduction installation makes it the logical answer.

The process offers fuel efficiency. And it is being tried on low cost bituminous coals. It can reduce low grade ores, making an iron product suitable for conversion to steel, using a minimum of electricity.

Developers of rotary kiln direct reduction are conscious of the need to feed iron to hot metal processes (oxygen converters and oxygen open hearths). In the last year, tests have been made on the conversion of direct reduction iron products to steel with intermediate hot metal stages. Combinations of rotary kiln direct reduction with hot blast cupolas, electric furnaces, and open hearths are being studied.

Sixties to Be Transition Period In the Steel Industry

F. M. Rich—The sixties will be a decade of transition in the steel industry. Iron ores previously classified as direct shipping will be beneficated to increase the productivity of smelting operations. Beneficiation processes formerly regarded as too expensive for use on iron ores will be examined closely, to determine what technological or economic changes would permit their commercial adoption.

The nation's iron ore sintering capacity will continue to expand. New equipment, instruments, and control devices will lead to automatic production of uniform, premium, blast furnace feed. When accelerated activity in sintering subsides, the industry will resume its search for techniques that could yield agglomerates with improved uniform physical characteristics. Processes that use fine iron ore in direct smelting will also be studied seriously.

Blast furnace productivity will reach record levels through the use of conveyorized material handling systems, the development of novel charging schemes, extended use of oxygen, exploitation of supplementary fuels, increased operating pressures, and precise raw material preparation. High unit productivity will make improved tapping methods necessary.

Basic oxygen steelmaking processes will continue to be developed. Significant changes can be expected in basic apparatus design. Many of the changes will occur as individual unit capacity approaches the popular size range of the modern open hearth. Eventually, the balance between open hearth and pneumatic processes will reflect the availability and cost of metallics for the charge.

Basic open hearth adherents will introduce new melting practices to take advantage of metallic charge flexibility, cold charge melting, and composition control. Furnaces will probably be modified to use fuel-oxygen burners, oxygen for decarburization, and continuous automatic controls.

Rolling mill development will be directed toward continuous, and in some

HIGH TEMPERATURE ALLOYS YOU CAN WELD OR BRAZE LIKE STAINLESS

In addition to their high strength characteristics, AM 350 and AM 355, A-L's precipitation hardening stainless steels, have other advantages for designers of missiles and supersonic aircraft.

When welding AM 350 and AM 355, there is little or no tendency to hot cracking or poor weld ductility, even in heavy sections. Both alloys weld as easily as the common stainless steels, even in the completely heat-treated condition. Brazability is equally easy—no special surface preparation is required during brazing operations.

Due to the high ductility in the annealed condition both alloys lend themselves to various kinds of fabrication—they can be spun, machined or formed using normal procedures.

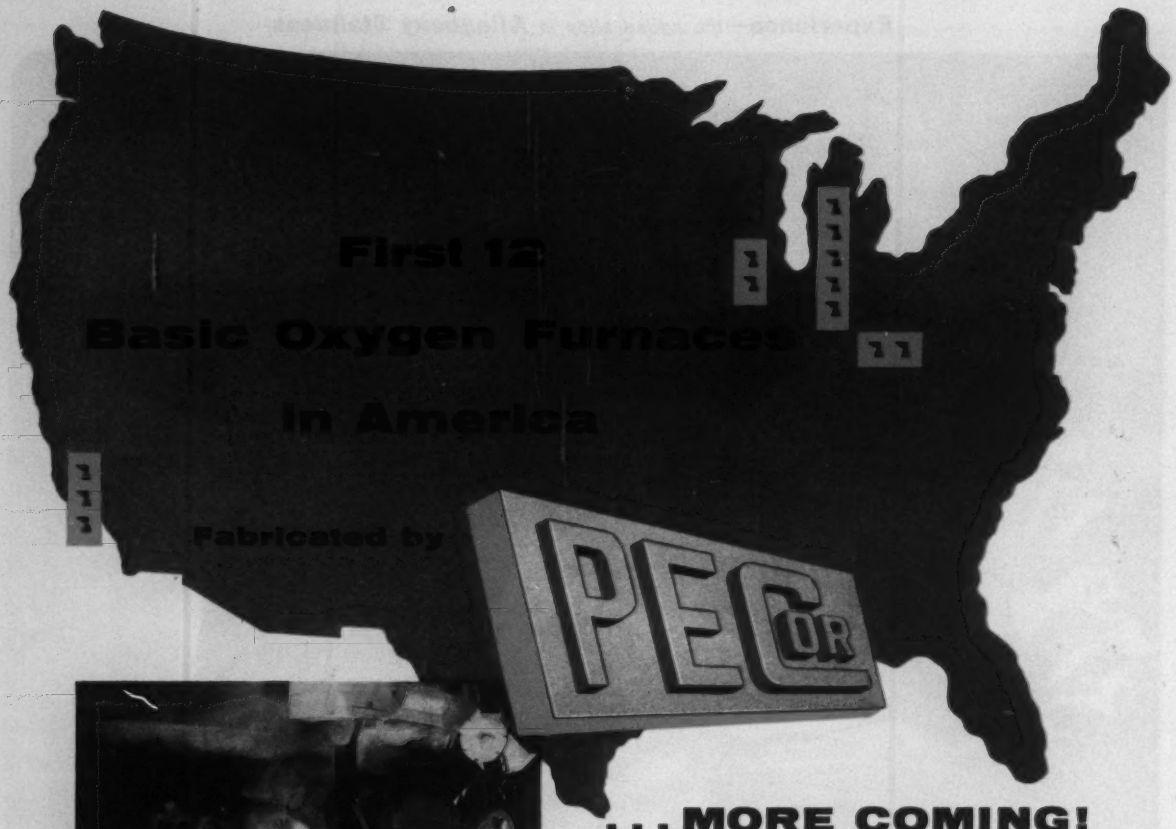
In the heat-treated conditions, AM 350 and AM 355 have remarkable strength-to-weight ratio at both room and elevated temperatures, retaining useful strength and ductility up to 1000 F.

AM 350 is available commercially in sheet, strip, foil, small bars and wire. AM 355, best suited for heavier sections, is available commercially in forgings, forging billets, plates, bars, wire, sheet and strip.

For further information, see your A-L sales engineer or write for the new technical booklet, "AM 350 and AM 355." *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.* 882

ALLEGHENY LUDLUM

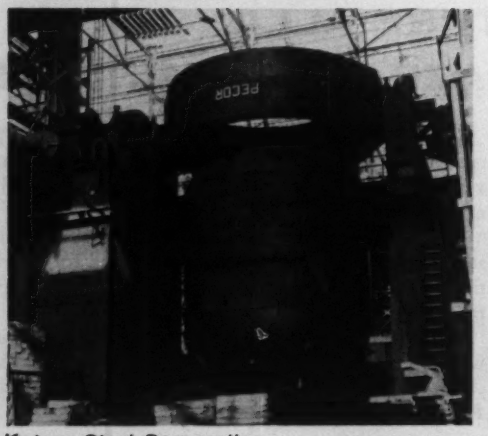
EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT



. . . MORE COMING!

In fact, PECor has fabricated all of the Basic Oxygen Furnaces that are in use or now being installed in America, including the major portion of the auxiliary equipment. When you have need of heavy machinery or equipment, rely on PECor's 75 years' experience in designing and fabricating for the steel, chemical, oil and other industries.

Jones & Laughlin Steel Corporation
Aliquippa Works



Kaiser Steel Corporation
Fontana Works

PENNSYLVANIA ENGINEERING CORPORATION
NEW CASTLE, PA.

OTHER STEEL PLANT EQUIPMENT WE BUILD

Blast Furnaces • Scrap Cars • Slag Cars
Oxygen Converters • Bessemer Converters
Hot Metal Mixers • Ore Transfer Cars
Ladles • Jack Cars • Ladle Transfer Cars
Ingot Cars • Mixer Cars • Thermo Metal (Bottle) Cars • Scale Cars

Sales Representatives:
Wooldridge Co., Burlingame, Calif.
Fred Middleton Co. Inc., Birmingham, Ala.

PECOR

Steelmaking

RAYMOND E. BIRCH
Director of Research
Harbison-Walker Refractories Co.
Pittsburgh

cases, multiple strand rolling of high quality products. Mill features will include full programing, automatic section control, high operating speeds, and heavy coil weights.

Popularity of Basic Roofs Expected to Continue

Raymond E. Birch—Success of basic brick roofs in American open hearths will continue in 1960. Campaigns have been consistently good; even the steel strike is thought to have had little effect on many of the roofs.

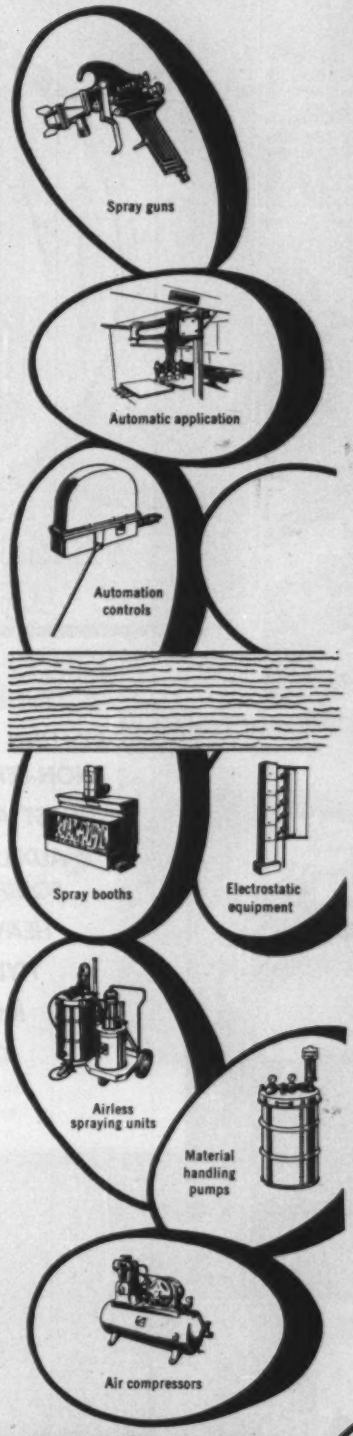
Better refractories are needed in other parts of the open hearth furnace, including front walls and ends, as furnace output is increased. Some innovations are promising. Engineering problems must be solved before basic roofs can be used on electric steel furnaces.

Oxygen steelmaking processes, which figure in most plans for new capacity, offer unique problems in refractories. They are solved by tar bonded basic refractories (made specifically for that use), but refractories that last longer would reduce both capital and maintenance costs. Better refractories are on the way.

New problem in refractories: The desire for higher blast furnace air temperatures. Stove top temperatures have already been pushed from 2000 to 2300° F, and temperatures above 2500° F are being considered.

That is rugged service because of the sustained heat soaking the checker brick receives. Superduty fireclay bricks with higher density and enhanced load bearing properties are being adopted for the

(*Continued on Page 202*)



It pays to . . .

put all your spray finishing problems in one basket

Binks "total finishing" equipment line and "total manufacturing" concept give you good reason for calling in a single source.

Your need alone governs recommendation. Binks makes a complete line of air atomization, electrostatic and airless atomization spray application equipment. You are assured of complete objectivity in application method recommendation.

Manual vs automatic vs automation. No two sets of production requirements are the same. This is why Binks line includes over 1400 units . . . from the finest in spray guns to the very latest in electro-mechanically automated equipment that handles production intermixes with virtually no loss in finishing materials.

Production "horse-sense." Knowing how to apply finishes is only half the battle. Understanding the relationship of finishing to overall production problems is the other half. Binks 67 years' experience on both counts . . . is like money in the bank when it comes to quality improvement and total cost reduction.

Call, wire or write today *to see how Binks "total finishing," "total manufacturing" concepts can go to work for you.*

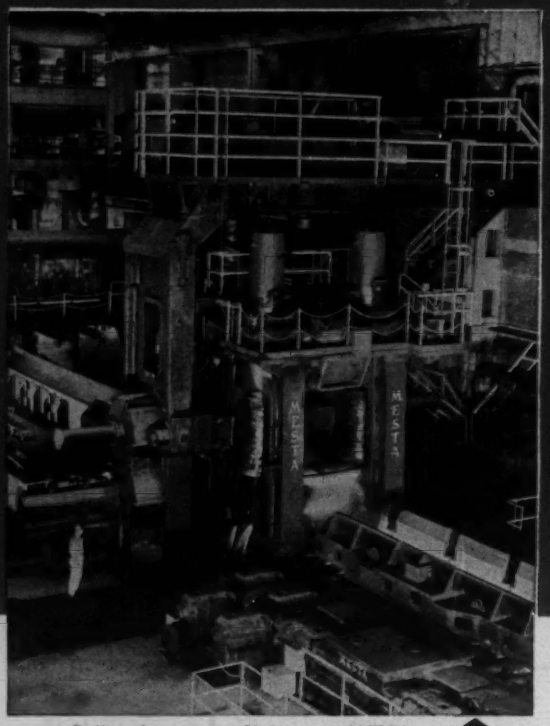
Ask about our spray painting school. Open to all . . . NO TUITION . . . covers all phases.

Binks
EVERYTHING FOR SPRAY PAINTING

Binks Manufacturing Company
3122-30 Carroll Avenue, West, Chicago 12, Illinois

0135

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES · SEE YOUR CLASSIFIED DIRECTORY



Rolling Ingots into Slabs on a MESTA
45" x 90" Universal Reversing Slabbing Mill

MESTA

DESIGNERS AND BUILDERS OF COMPLETE STEEL PLANTS

ROLLING MILLS FOR FERROUS AND NON-FERROUS METALS

CAST AND FORGED MILL ROLLS

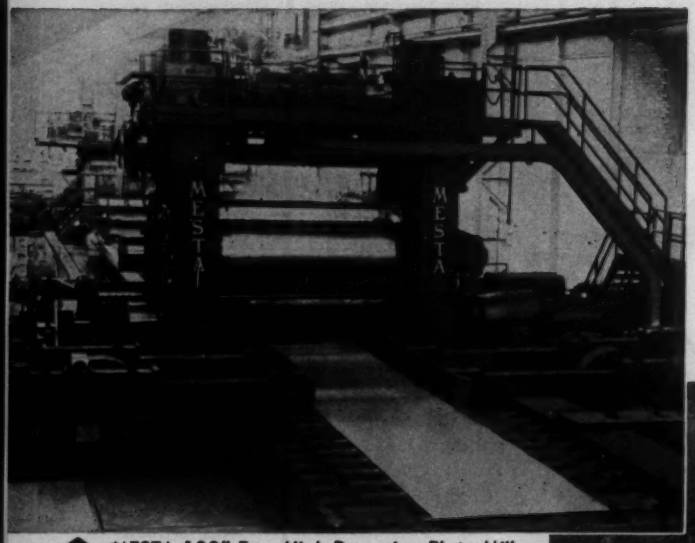
AUXILIARY MILL AND PROCESSING EQUIPMENT

HEAVY DUTY MACHINE TOOLS

HYDRAULIC FORGING PRESSES

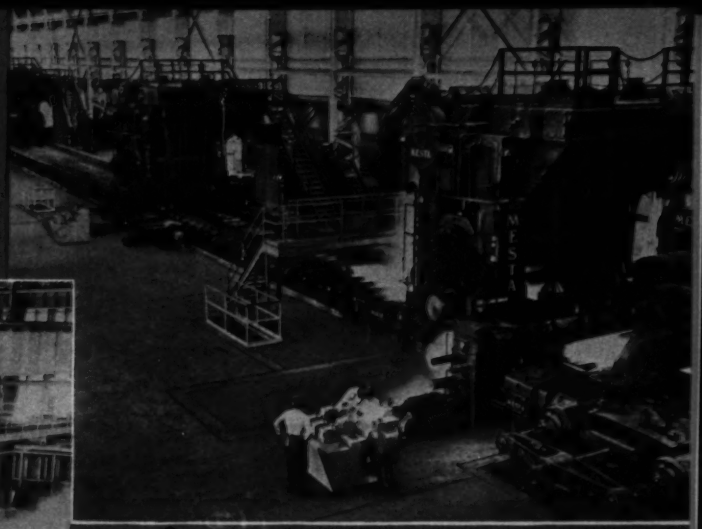
IRON AND STEEL CASTINGS

GEARS • FORGINGS

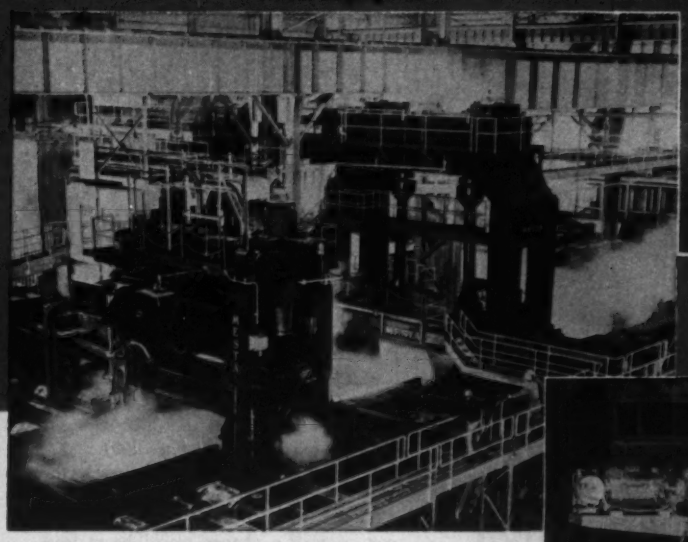


MESTA 132" Four-High Reversing Plate Mill

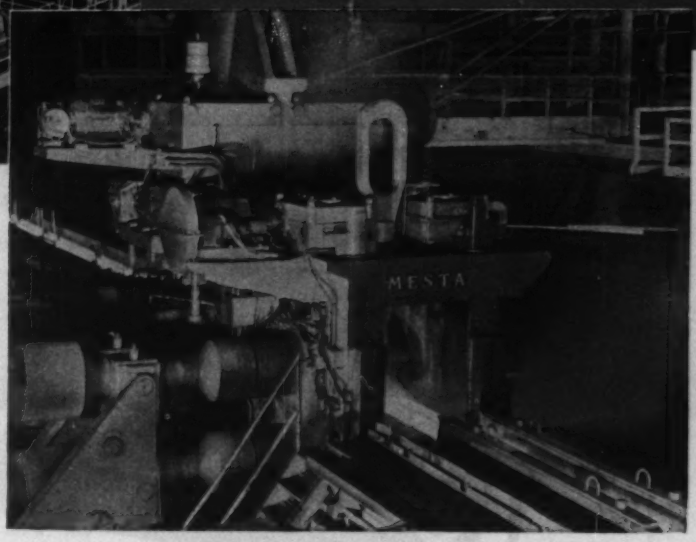
Six Finishing Stands with Three Vertical Edgers
on the MESTA 44" Four-High Hot Strip Mill



Rolling Slabs and Plates on the MESTA 140" Four-High Reversing Mill and Vertical Edging Mill

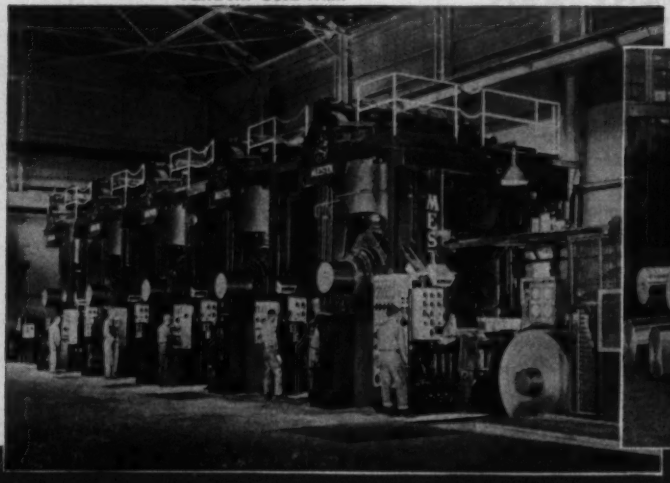


MESTA Continuous Hot Strip Mill Universal Roughing Stands Rolling Strip Steel

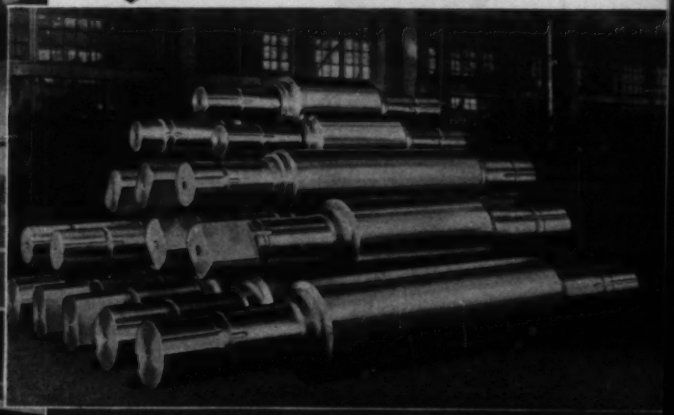


MESTA Universal Structural Mill Rolling Wide Flange Beams on the 44" Universal Stand and the 34" Edging Stand

Rolling Strip Steel for Tin Plate in Coils on a MESTA 48" Four-High Five-Stand Tandem Cold Mill.



MESTA Hot Strip Mill Working Rolls



MESTA MACHINE COMPANY

PITTSBURGH, PENNSYLVANIA

DON'T LET THE PRICE FOOL YOU!

Despite Their Lower Cost

BROOK A.C. MOTORS

Give Outstanding Service

Anybody who knows motors will recognize that there is no finer motor than the Brook. These motors have established excellent service records in industry. Yet, they actually cost less!

Space age production methods and extensive distribution in 76 countries makes possible this better motor at lower cost. All standard enclosures. 1 to 600 H.P. Start saving now —look into Brook Motors at once. Write for literature and name of your dealer.

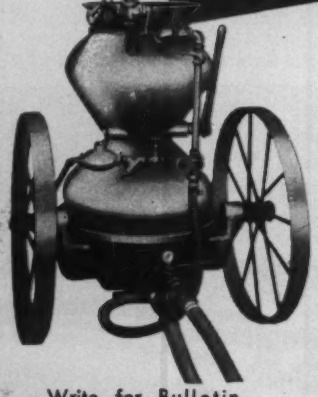
SINCE 1904
BROOK ELECTRIC MOTORS

world's most respected motor

BROOK MOTOR CORPORATION
3302-04 W. Peterson Ave., Chicago 45, Ill.

Factory Representatives, Warehouses, Dealers, Service Stations, in Major Cities
In Canada: Brook Electric Motors of Canada Ltd., 250 University Ave., Toronto, Ont.

Save! ON FURNACE REPAIR and REFRACTORY INSTALLATION



THE "CEMENT GUN"® METHOD

The CEMENT GUN is simple to operate; two or three of your own men can learn quickly and easily, after which they can make all your refractories repairs. With the CEMENT GUN they can place a lining 1" to 6" thick in one continuous operation. They can make patches in a "hot" furnace. They can place up to 5 thousand pounds of refractory material an hour. The CEMENT GUN method saves down time, saves material and extends the life of your present linings. Write today for further information.

Write for Bulletin No. 3000-B Today!

CEMENT GUN COMPANY
Gunite® Contractors
1518 Walnut Street • Allentown, Pennsylvania

Steelmaking

R. P. HEUER
Vice President
General Refractories Co.
Philadelphia

(*Concluded from Page 199*)

top checkers; if temperatures reach the upper limits, the best mullite and high alumina bricks will be needed. Initial cost of such a change would be at least equal to the switch from silica to basic bricks in the open hearth. Fortunately, a new semisilica refractory is available. It should handle any anticipated requirements in combustion chamber or dome.

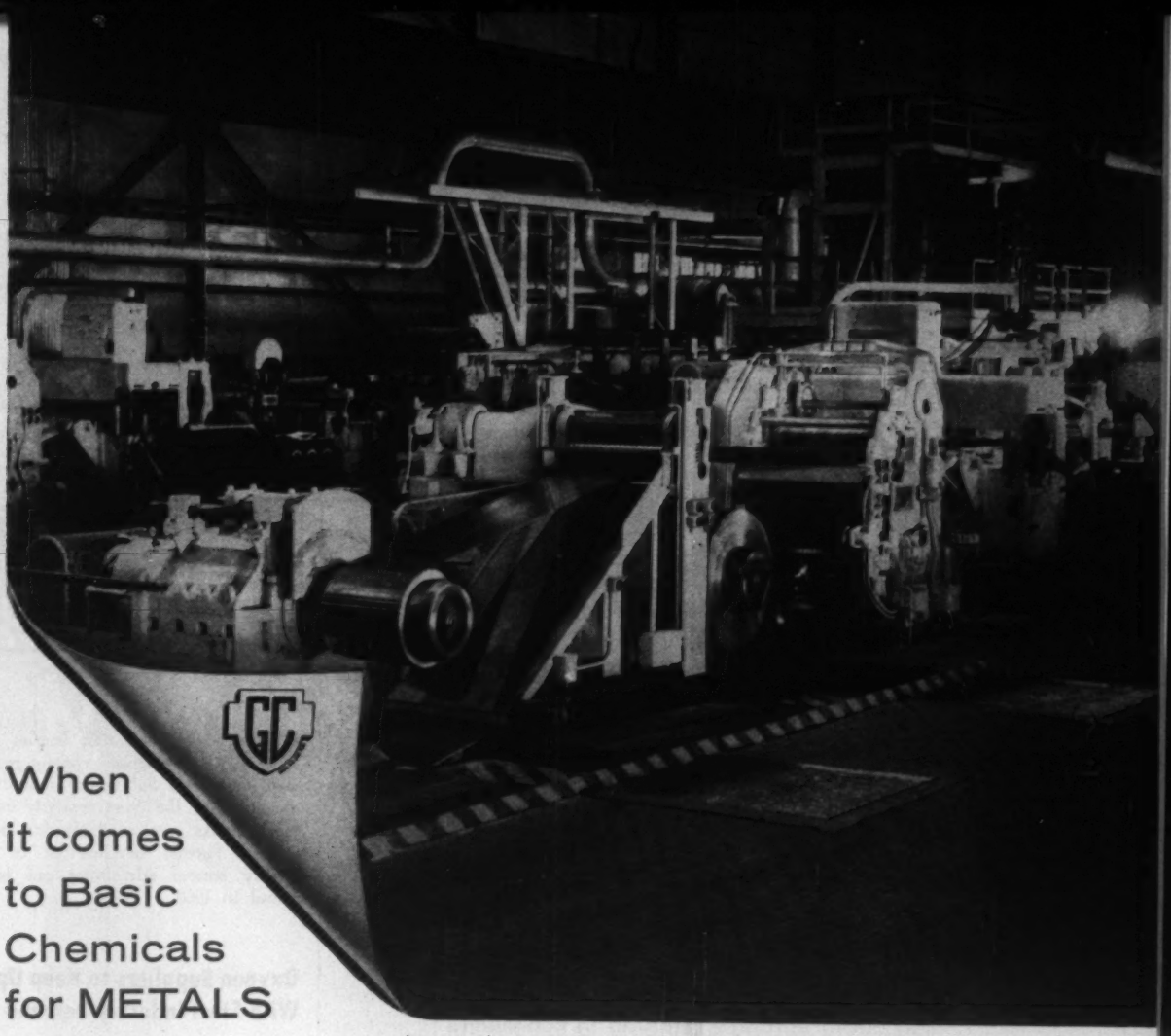
Growing Popularity Predicted For All-Basic Open Hearth

R. P. Heuer—The all-basic open hearth has fulfilled all expectations and will continue to gain popularity. More than 200 of the furnaces are in operation. They are used for all types of operation, from cold metal charging to duplexing. Every major steel company is operating some basic furnaces, and several shops use them exclusively.

Refractories responsible for the rapid swing to all-basic construction are double internal plated, chemically bonded chrome-magnesite and magnesite-chrome bricks. Superiority of chrome-magnesite or magnesite-chrome composition hasn't been established. But the bricks must have double internal plates for best results.

After the recent resumption of steelmaking operations, many basic furnaces were heated up faster than silica furnaces. More than 90 per cent of the basic roofs were put back into operation without appreciable damage. The basic furnaces that had to be rebuilt were in most cases old ones which had given long service prior to the shutdown. Silica roofs required much more rebuilding.

Oxygen lances are being used more in all-basic furnaces. The practice is expected to give the nation's steelmaking



When it comes to Basic Chemicals for METALS

...come to General Chemical!

There are good basic reasons for making General Chemical your source of supply for basic chemicals. Our large-scale production is one. Long experience is another. And there are many more—including consistent high quality and uniformity of product... top-notch technical service... a coast-to-coast network of plants and distribution points... plus efficient follow-through from order to delivery and beyond that to satisfactory performance. That's why—when it comes to basic chemicals—it's wise to come to General Chemical for all these products....

Sulfuric Acid	Fluoboric Acid
Hydrochloric (Muriatic) Acid	Potassium Fluoborate
Nitric Acid	Sodium Fluoborate
Hydrofluoric Acid	Ammonium Fluoborate
Sodium Fluoride	Lead Fluoborate
Sodium Bifluoride	Tin Fluoborate
Trisodium Phosphate	Copper Fluoborate
Sodium Metasilicate	Iron Fluoborate
Sodium Silicate	Nickel Fluoborate
Oxalic Acid	Cadmium Fluoborate

Baker & Adamson® Laboratory Reagents

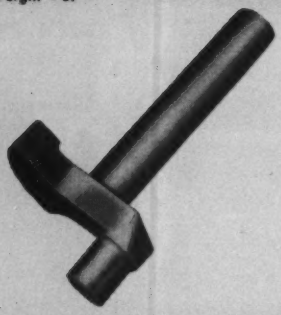
Basic to America's Progress

Allied Chemical

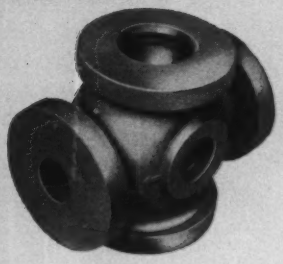
GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

URICK'S DUCTILE IRON

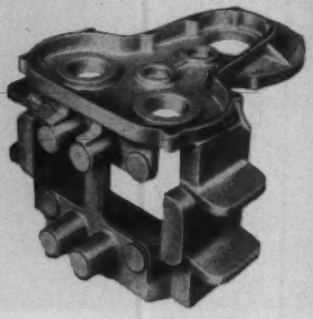
Weight #37



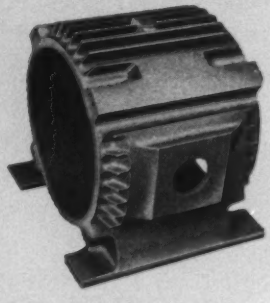
Weight #62



Weight #41



Weight #75



. . . PRODUCTION RUNS with a custom finish

URICK successfully casts many small parts or components of Ductile iron on a production basis.

Because of URICK'S team "know-how" and modern facilities, these precision castings are no longer considered a custom task involving added expense and time, but are mass produced with effective savings.

Naturally URICK'S knowledge of stress, strain, and impact values helps in recommending Ductile where it will serve best. Possibly you have components that URICK can help you convert to Ductile to your advantage.

Remember, castability, weight reduction and reduced machining time with longer tool life, all add up to real economies. Ask URICK about their Ductile recommendations before you decide on your next casting run.

URICK is the foundry that starts with "U" and stays with YOU. Write for bulletins on URICK'S Ductile and Urite casting facilities.

URITE CASTINGS

URICK FOUNDRY

ERIE, PENNSYLVANIA

LICENSED UNDER PATENTS OF THE INTERNATIONAL NICKEL COMPANY., INC.

Steelmaking

T. J. MILHAUPT
Manager, Bulk Gas Sales
Linde Co., a div. of
Union Carbide Corp., New York

capacity a big boost. But bottom materials of higher magnesia content must be used for repairs. Substantial quantities of magnesite, of the types regularly used to make bricks, are available for bottom repairs. Further development of high quality bottom refractories can be expected in 1960.

Oxygen Suppliers to Keep Up With Steel Industry Demand

T. J. Milhaupt—Oxygen steelmaking processes will continue to gain popularity in the next two or three years.

The immediate problem for suppliers is to keep up with increased needs of the steel industry. They will be met largely by tonnage on-site oxygen plants, backed up by a network of liquid oxygen production, delivery, and storage. The flexibility of supply offered by such a system eliminates the need for standby production units on customer property.

A sizable block of new ingot capacity will be provided by the L-D oxygen steelmaking process and by other innovations being tested throughout the world.

Oxygen additions in blast furnaces will be increasingly important to the steel industry. Theoretical analysis, computer studies, and limited tests indicate that oxygen can increase hot metal production in present facilities with only nominal capital expenditures.

Use of oxygen in electric furnaces will also increase. Oxygen will be supplied through lances to speed meltdown and upgrade the product. It will also be used in auxiliary burners mounted in furnace doors (a development announced late last year by Linde Co.).

AN IMPORTANT MESSAGE FOR ELECTRIC STEEL FURNACE OPERATORS

The performance requirements of graphite in nuclear and space age applications are spurring advances in graphite technology that were unheard of a few short years ago.

Research and development progress attributable to these newer graphite uses is rapidly adding to the fund of technical knowledge of graphite's unique properties, and to increasingly tighter controls in its manufacture.

GLC graphite is now employed in many of today's new applications such as nuclear moderators, missiles, rockets, honeycomb steel brazing and so on.

Users of GLC electrodes in electric steel furnaces can be sure that GLC graphite specialists are making significant contributions in these advanced technological areas—and that their findings are being translated into improvements in GLC electrode columns and superior customer service.

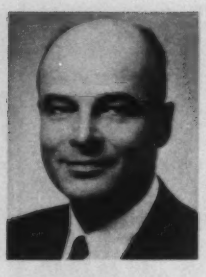
We welcome opportunities to assist you in lowering electrode costs per melt ton.

PRODUCTS ELECTRODES GLC DIVISION YOU CAN TRUST

GREAT LAKES CARBON CORPORATION

18 EAST 48TH STREET, NEW YORK 17, N. Y. OFFICES IN PRINCIPAL CITIES

FORREST M. PALMER
Technical Director
Aluminium Ltd. Sales Inc.
New York



RICHARD M. STEWART
President
American Brass Co.
Waterbury, Conn.

PIERCE M. WELPTON
President
Bridgeport Rolling Mills Co.
Bridgeport, Conn.

JOHN WILLARD
Manager, Sales
Development Div., Aluminum
Co. of America
Pittsburgh

1960 FORUM ON TECHNICAL PROGRESS

Nonferrous Metal Production

Transportation Gains to Pace Aluminum's Growth in 1960

Forrest M. Palmer—Some of the most significant advances in aluminum technology and applications during 1960 are likely to be in transportation.

In the automotive field, the groundwork of technique is laid for a major breakthrough in diecast engine blocks. In the railway industry, development work on applying welded structural alloys began to pay off in tonnage usage in 1959.

The same structural alloys and welding techniques will expand aluminum usage in other forms of transportation—from dump trucks to ordnance vehicles.

Copper and Brass to Step Up Tempo of Research Efforts

Richard M. Stewart—There is increasing evidence that the copper and brass industry—long overdue in taking the plunge into important areas of research and product development—has come alive. I believe users will see results in the year ahead. During the next three or four years, the tempo will be stepped up. Many producers and fabricators are involved.

You already hear talk of new alloy structures; drastic improvements (quantitative and qualitative) over present processing methods; fundamental research aimed at uncovering information needed for modern applications of copper-base alloys; and radically new approaches to production techniques.

Within recent months our company has announced availability of several new products which are the fruits of a full scale product development project now in its second year. Other new products are in various stages of investigation, some of which should be ready for 1960 launching. Our intentions are to amplify the program as fast as personnel and facilities will permit.

Brass Mills to Step Up Use Of Continuous Casting

Pierce M. Welpton—We are looking forward to more productive use of continuous casting facilities for nonferrous metals. Results of pilot operations indicate that many new alloys will be produced for high volume applications. Metallurgically and economically we feel the Hazelett process offers the greatest potential.

Improved dimensional controls may be expected with the further development and refinement of self-regulating mill equipment. Such progress must be realized to properly service the fast growing electronics and nuclear industries.

Faster and more effective metal treating processes will also be necessary to meet the critical specifications of specialized industries.

Ultrasonic Welding Pegged As Boon to Aluminum Usage

John Willard—Ultrasonic seamwelding of foil and light gage sheets will have a marked impact on the aluminum industry.

The method is showing particular promise for the container and packaging industries, automobile radiator manufacturers, and the electrical industry. Unlike induction or resistance processes that involve melting, ultrasonic welds can be stopped and started abruptly, without producing long startup seam sections of inferior quality.

The ultrasonic weld will be smoother,

JERRY SINGLETON
Executive Secretary
Magnesium Association
New York

CHARLES C. RIETH
Manager-Nickel Sales
National Lead Co.
New York

R. DAVISON
Manager
Market Development Div.
New Jersey Zinc Co.
New York

T. E. VELTFORT
Managing Director
Copper & Brass Research Assn.
New York

cleaner, and stronger than cemented side seams now used in aluminum can manufacturing. Development work will result in increased welding speeds and the processing of heavier gages.

The industry is introducing more highly fabricated mill products, such as prepainted residential siding and roofing. They enable the consumer to reduce the amount of field fabrication and assure him of a quality product with a finish or color of his choice.

In residential building, the trend is to materials that are easier to install and require less painting and maintenance.

Another advance is aluminum's entry into the electrical structural field, for such applications as transmission towers and substations.

Industrial Uses of Magnesium Will Continue Growth in '60

Jerry Singleton—Magnesium gives promise of increased industrial application during 1960. The dependence on defense markets is still fundamental, but the trend is toward civilian application.

Greater usage is being made by the automotive industry, largely in diecastings, although accelerated application is reported in tooling plate. The promise of magnesium truck wheels cannot be overlooked.

Development of a cold bending sheet, available in coil form, and a sheet which need not be stress relieved after welding are expected to win acceptance in several new markets. Foundries generally are supplying more complex thinner walled castings—many of which involve considerable machining and finishing prior to delivery. Increased use of magnesium in the missile program (for frames and powerplants) appears assured.

Shipments of primary magnesium last year exceeded production by about one-third. With two primary producers operating in 1960, production and shipments will probably be in closer balance. Predicted increases in the production of aluminum alloys (and possibly titanium) could create demand which would force the reopening of facilities that have been out of production since early 1958.

Commercial Uses of Stainless Most Promising for Nickel

Charles C. Rieth—I feel that commercial uses are the brightest spot on the stainless horizon. I feel sure that the required nickel for such an accelerated program will be available.

During 1959, nickel had its ups and downs. In the first half sales were good, as producers in the steel industry were trying to build up their own and customers' inventories.

While the nickel business was good during the latter part of the year (after the resumption of steel activities), it hardly made up the ground that many people had hoped. Companies tied closely to the steel industry suffered materially during the strike; those with greater diversification were more fortunate.

Almost everyone is looking to 1960 as a good year for nickel. However, there may be some uncertainties—particularly the political situation in Cuba (which may eventually affect the two nickel operations there). However, I am quite optimistic about the solution of this problem.

Current Crop of Autos Boost Role of Zinc

R. Davison—Great changes are evident in the automobile industry. The adoption of unitized body construction for the compact cars will boost demand for zinc coatings, largely applied as galvanizing. Zinc rich paints, or zinc chromate over standard zinc phosphate treatments, are alternate methods.

Improved techniques in chromium plating diecast zinc parts are being used on practically all 1960 models. And automobile manufacturers are returning to zinc diecast grilles—Buick, Imperial, Continental, Mercury, Oldsmobile, Pontiac, Rambler, Ambassador, and Hawk.

Zinc rich paint is a newcomer in the field of rust inhibitive coatings. Like galvanizing, it protects against rusting by sacrificial action, utilizing the electrical potential and conductivity of its high zinc content (95 per cent by weight).

In powder metallurgy, the use of brass and nickel silver powders has increased faster percentagewise than that of ferrous powders. They're being used increasingly in many categories of durable goods.

Recent Brass Mill Advances Will Aid Metalworking

T. E. Veltfort—Recent brass mill technical advancements in methods and equipment should have a notable impact on metalworking.

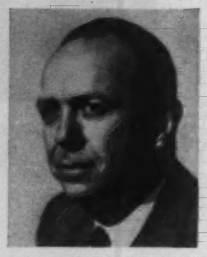
For instance, the 2500 ton, hot extrusion press recently installed in a Waterbury mill permits production of longer and heavier tube shells. The press can process almost twice the tonnage previously handled on this type equipment.

Another brass company has announced a bimetal condenser and heat exchanger tube which will have major applications in the chemical, food processing, and refrigeration industries. A new, economical, nickel plating process introduced by a Connecticut brass company looks promising.

A Michigan copper firm's new, light wall seamless metal tubing can be shipped in ribbon form and inflated at point of use.

Thermostat cups are being impact extruded from copper rods. Result: A supe-

Nonferrous Metal Production



J. L. KIMBERLEY
Executive Vice President
American Zinc Institute Inc.
New York

C. P. GOSS
Vice President
Scovill Mfg. Co.
Waterbury, Conn.

J. C. DOUGLAS
Vice President, Technology
Union Carbide Metals Co., Div. of
Union Carbide Corp., New York

rior product at less cost to the ultimate customer.

A mirror finish for plater bars recently reported by another brass mill required several years of experimentation with milling cutters, milling machines, cutter speeds, and lubricants. The same mill recently developed a technique for producing phosphor bronze wire in 1000 lb coils primarily for the makers of Fourdrinier wire screens for papermaking.

The development of a longer lasting coating to prevent tarnish is perhaps the most imediate problem facing the brass mill industry. Architectural alloys have a durability that provides excellent service for both interiors and exteriors, but they would give even better service with a coating that could withstand the weather, dirt, and corrosive atmospheres without excessive maintenance and without concealing the inherent warmth and beauty of the copper metals.

Major Zinc Uses to Increase; Research Efforts Accelerated

J. L. Kimberley—In galvanizing, a continued upward trend is anticipated in the use of zinc to protect steel in all areas of use.

Further growth is expected in diecasting. Evidence: The automotive industry has returned to zinc from alternate metals in significant areas: Oldsmobile and Pontiac grilles, Plymouth door handles, and a substantial increase in dashboard panels and instrument cluster frames.

A major program involving the automotive, diecasting, and plating industries, supplemented by the zinc industry through American Zinc Institute research program, has resulted in marked improvement in the serviceability of chromium plated zinc diecastings for automotive exteriors.

In the field of rolled zinc, a marked increase in activity has been noted. Improved alloys are being offered, and marked growth is anticipated.

The use of zinc in brass, in the form of oxide, and in chemicals will progress at least in proportion to the national industrial activity levels.

Competition will remain keen. Synthetics, as well as the light metals, are vying with zinc for basic areas of application. Some intrusions of competitive materials will be real and permanent for technical reasons. Some will be temporary for equally valid technical reasons.

Casting, Extrusion Processes Being Automated by Brass Mills

C. P. Goss—We look for no spectacular innovations in the copper alloy and aluminum alloy fields during 1960, but we anticipate steady development and application of processes and materials now in use.

Continuous casting is being installed in more plants every year.

In the copper alloy field, there is interest in continuous casting rods about 0.5 in. in diameter to bypass the extrusion operation and still have a quality product suitable for rolling and drawing. Two producers are already using the method.

The continuous casting of tough pitch copper is growing, and we expect that most major producers will eventually adopt the method. Product quality is excellent, and cake size can be much larger than that previously available.

Extrusion presses being installed are much larger and far more automatic than those used a few years ago. The increase in productivity via the use of large billets is one advantage. A smaller operating crew is made possible by automatic operation.

Close tolerances customarily required on sheets and strips have caused great interest in automatic gaging and servomechanisms to adjust the rolls. Automatic contact gages and radiation gages are universally employed, and the trend to even more accurate gages continues.

Shaped copper alloy tubular products are becoming more popular. Water cooled bus bar and conductor sections can carry more current because the heat is dissipated by water cooling. Hollow rods and shaped sections offer obvious advantages over conventional solid rods when the finished part is to be bored.

Predicts Many Advances In Columbium, Tantalum

J. C. Douglas—Improvements in the technology of working columbium and tantalum may be expected in the near future in such areas as: Primary metal production, melting technology, alloy development, fabricating techniques, coatings, and perhaps even in scrap reclamation.

In primary metal production, scale-up to increase production and improvements in process technology are expected to result in substantial price reductions during the next several years.

Improvements in melting technology are expected. The electron beam melting technique may soon be used on columbium and tantalum. Consumable electrode melting, which yields large, high quality ingots, is almost certain to reach the commercial development stage soon. It has been demonstrated that the skull melting and casting technique is feasible for columbium; the method may increase the availability of forms and result in cost reductions. Another area which may be explored: The cold mold, induction melting technique now being studied for titanium.

New and improved fabrication techniques will be worked out in the coming months. For example, impact extrusion, "frictionless," high reduction extrusion, and other high-deformation-rate techniques will be studied for the ingot breakdown of superstrength, high temperature columbium and tantalum alloys. "In-Fab" rooms, in which primary fabrication is done in an inert atmosphere, and the use of in-process protective coatings during hot working will also be tried. Conventional techniques, such as forging and

sheet rolling, will not be neglected. For secondary fabrication products, explosive forming may prove useful.

In looking ahead at the technological needs and problems faced by columbium and tantalum producers and processors, these seem to stand out: Practical methods for heating ingots to the ingot breakdown temperature, development of suitable coatings to protect the materials during the hot and intermediate warm working operations, and the development of facilities suitable for vacuum annealing large structural shapes (such as sheets, bars, and tubes) at high temperatures.

Coming: Refractory Metals In Any Shape or Size

J. Z. Briggs—Within the next three years, it is believed that industry will develop means of processing and fabricating the whole family of refractory metals in any desired shape and size.

Refractory metals are gaining increasing acceptance as standard materials. Considerable work is being done on new production methods, ranging from electron beam and zone melting to vapor and plasma arc deposition. But it appears that the present commercial processes, powder metallurgy and vacuum arc casting, will continue to be the most important for at least the next few years.

Molybdenum metal and molybdenum base alloys have been used in large quantities and have made good progress toward becoming standard engineering materials.

Outstanding results have been obtained with molybdenum-base cores in diecasting aluminum and copper alloys. Their use for small insert dies is already feasible. Development work holds promise for large dies that will make the diecasting of copper alloys economical.

The other refractory metals, particularly tungsten, columbium, and their alloys, are being studied extensively. Relatively large tungsten ingots have been prepared by sintering and vacuum arc melting and are proving amenable to fabrication—although not with the ease of molybdenum. Tungsten-molybdenum alloys have long been known for their resistance to molten zinc, and a few small sintered parts have been used.

Sound, Vibration Reduction: Important New Uses of Lead

R. L. Ziegfeld—Recognition of the unique ability of lead to reduce sound and vibration was among the most exciting developments last year. The metal has been used under commercial air conditioning cooling towers atop buildings with outstanding success. An intensive research program has been initiated to develop engineering data over a wide range of loads and frequencies to help engineers design for optimum performance of lead.

The metal is used in the latest Douglas aircraft to reduce noise in cabins. The technique: A vinyl plastic heavily loaded with lead powder and backed with a cotton duck or glass fiber fabric. Other sound deadening applications include building partitions, folding doors, all kinds of vehicles, and office machinery.

A recently perfected machine continuously extrudes pure lead and a variety of cable sheath alloys, such as antimonial lead, copper lead, and the arsenical alloys.

Research in leaded ceramics has resulted in new products with immense possibilities. Leaded low dielectric loss ceramics are receiving major attention from the electronics industry, as are piezoelectrics like lead zirconate-titanate used in stereophonic pickup cartridges—which may be used in such products as supersonic dishwashers. The application of lead-bearing porcelain enamels on aluminum and copper is growing rapidly. A new product, a sheet steel chalk board with a low firing, lead bearing porcelain enameled surface, is undoubtedly the forerunner of many other steel products, like appliances, that will be so finished.

A new pigment, basic lead silicochromate, offers for the first time a relatively low cost, anticorrosive pigment for automobiles, appliances, road building and farm machinery.

1960 Outlook for Titanium: More Uses, Broader Base

T. W. Lippert—Titanium will be anchored this year in the deep waters of a development market, toward which it has been moving since mid-1957.

The reasons: Major applications in missiles and aircraft will be in prototype construction; products and fabrication techniques of prime interest to chemical processors will enter the testing phase of operations; production runs of manned aircraft—to date, titanium's major market—can only be expected to dwindle.

In brief, more organizations will specify titanium, but they'll use less individually than they did. Accordingly, the industry anticipates shipments will hold level or increase slightly.

However, a new and broader base for titanium application should be established which will enable the industry to move ahead.

For example, heat treated forging billet Ti-7Al-4Mo provides strengths equal to 4340 steel. Since no design adjustments are required, the alloy lends itself to substitutional applications on a direct volume-for-volume basis. A completed part will have a configuration identical to that of a steel part, but it will yield a weight reduction of 40 per cent.

Nonferrous Metal Production

J. Z. BRIGGS
Director, Technical Information, Climax Molybdenum Co., Div. of American Metal Climax Inc.
New York

R. L. ZIEGFELD
Lead Industries Association
New York

T. W. LIPPERT
Director of Marketing
Titanium Metals Corp. of America
New York

Two other heat treatable titanium grades—Ti-13V-11Cr-3Al (often called VCA-beta) and Ti-4Al-3Mo-1V—are subjects of intensive activity: The beta alloy for rocket-motor cases enables construction 30 per cent stronger than any of the new steel alloys; the Ti-4Al-3Mo-1V alloy is for structural members of advanced high speed aircraft.

Procedures for welding titanium to carbon steel are being evolved and could bulk large in overcoming the chemical

Nonferrous Metal Production

R. D. COURSEN
Director
Malayan Tin Bureau
Washington

HEINZ V. MENKING
General Director, Product
Development Div., Reynolds Metals Co.
Richmond, Va.

H. E. SEARLE
Manager, Platinum Metals Div.
International Nickel Co.
New York

D. A. RHOADES
President
Kaiser Aluminum & Chemical Corp.
Oakland, Calif.

processing industry's reluctance to use the metal because of its price. If the project meets with success, titanium lined equipment could be marketed in the price area of rubber lined assemblies and finally open the door for flat rolled titanium in nonaircraft applications.

The industry will pay particular attention to development of platinum-coated titanium anodes, to replace graphite, in the production of chlorine.

The need for titanium castings continues, and research in this area in 1960 will probably proceed at the pace of two steps forward, one step back.

Can Market to Pace Growth Of U. S. Tin Sales in '60

R. D. Coursen—Most of tin's chief markets appear to have growth potential. The largest user in the U. S. is the tin plate industry, consuming 60 per cent of all primary tin, largely for containers.

With the expansion of beer and soft drinks packaged in cans, the increased production of aerosol containers, and other new uses in the food and beverage fields, it appears that the traditional growth of tin plate will be continued during 1960.

Solder, consuming 14 per cent of all primary tin, should also increase, principally due to an expansion in the electronic and electrical fields. Increased emphasis is being placed on research into the dip soldering of heat exchangers, radiators, and similar equipment, as well as the soldering of electronic circuitry.

The merits of phosphor bronze tend to support the projection that tin-in-bronze will at least hold its 1959 level this year. Research is aimed at new uses, particularly in the automotive and construction fields.

Aluminum Consumption Gains In Major Target Areas

Heinz V. Menking—Aluminum scored a major breakthrough in the railroad industry in 1959. Some 1200 aluminum gondola and covered hopper cars were ordered by one railroad—the first large scale use of all-aluminum rolling stock by American railroads. More significant than the size of the order is the discernible trend to strong consideration of aluminum for entire cars.

Several new products show promise: Bulk containers, a new shipping medium for land, sea, and air; all-aluminum engines in a new compact car; and aluminum hatch covers for ore carriers.

The military forces, long deprived of aluminum's advantages because of Air Force priority and inadequate supplies, are increasing applications. Examples: Vehicles with aluminum armor plate, fuel cells, ammunition racks, fenders, bogey wheels, treads. Lightweight cargo trucks increase the dependability of supply and personnel carriers. Aluminum pallets increase cargo capacity of air lift operations and contribute economy and efficiency to logistics.

Residential uses move steadily forward in conventional construction and manufactured homes. Panelization, using aluminum skins and foamed organic cores, has moved from design studies to extensive testing programs and shows promise of becoming a volume application.

Corrosion resistant aluminum pipelines for the petroleum industry gained in popularity, particularly for offshore collection lines exposed to sea water and marine borers. Heavy-End extruded pipe, developed and produced during the year, provides joints with strength equal to pipe walls.

Industrial Firms Consume 85% of Platinum Metals

H. E. Searle—Demand for the precious platinum metals (platinum, palladium, rhodium, ruthenium, iridium, and osmium) is being spurred by wider recognition that they often cost more than other metals in selected industrial applications.

The platinum metals are getting wider consideration because of their performance and proved economy in a number of applications: Platinum catalysts in reformers producing high-octane gasoline; metallic platinum and its alloys in the making and forming of hot glass; small palladium contacts in automatic electrical switches and controls; palladium catalysts in chemical synthesis.

New and Improved Aluminum Shapes, Finishes Are on Way

D. A. Rhoades—The sixties will be another decade of great progress for aluminum.

With no intention of minimizing the importance of other areas, I will emphasize two fields.

One is finishes. The variety of finishes and finishing methods has been a major factor in aluminum's growing applications where appearance is a major consideration. Close to the point of commercial introduction are improved finishing and color coating methods.

Second is in the improvement in both the quality and range of availability of many forms. For example, alloys with higher strengths and better properties for missile and aircraft construction; improved ingot and billet casting methods for better, more consistent quality; and

FRASSE ALUMINUM

helps tell how she's doing!

Ballistic missile success hinges on intelligence obtained in test firings. Tracking data – reporting velocity, direction, altitude, temperature, etc. is vital – when processed, it guides critical design changes.

Heart of the intricate data processing system at Cape Canaveral is a Potter Magnityper – a high speed electronic printer that decodes raw material . . . then stores, collates, interprets and prints at 72 *thousand* characters per minute. Lightweight, non-magnetic aluminum is essential to its efficient operation – that's why the Magnityper is made almost completely of Frasse aluminum.

Frasse ships the required sizes quickly from stock – in the grades that contribute to its ease of fabrication *and* performance. For example, Frasse supplies 2024-T4 bars for *strength* and *machinability*, 5052-H34 sheet for *formability* and *weldability* and "775" tooling plate for *dimensional accuracy* with *no distortion when worked.*

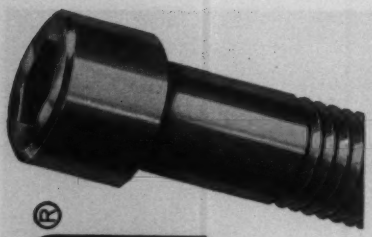
Perhaps these same qualities can increase the efficiency of *your* product – or reduce fabricating costs. It's worth investigating – and a Frasse aluminum specialist will be glad to help. There's no obligation – simply write or call your nearest Frasse office. You'll be glad you did.

Call FRASSE for ALUMINUM

Screw Machine Stock • Bars • Rods • Wire Sheets • Plates • Tubing • Holobar Pipe • Fittings • Valves • Extrusions Tool and Jig Plate

Peter A. Frasse & Co., Inc.

NEW YORK 13, N. Y.	PHILADELPHIA 29, PA.	BUFFALO 7, N. Y.	SYRACUSE 1, N. Y.	HARTFORD 1, CONN.
17 Grand St.	3911 Wissahickon Ave.	P. O. Box K, Sta. B	P. O. Box 1267	P. O. Box 1949
WAlker 5-2200	BAldwin 9-9900	BEdford 4700	HOward 3-8655	JAckson 9-6861

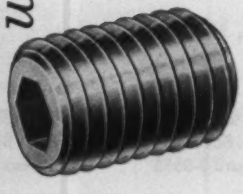


B-RIGHT-ON®

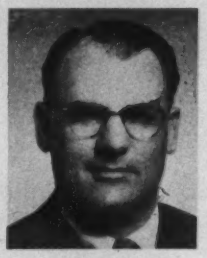
SOCKET SCREW PRODUCTS

1835 Reading Road Cincinnati 2, Ohio

You can do better with...



Nonferrous Metal Production



F. A. McGONIGLE
Vice President
Howe Sound Co.
New York

the development and installation of advanced production equipment, such as the 30 million lb plate stretcher at our Ravenswood, W. Va., works, to improve product properties and broaden availabilities.

Because it is necessary to lead the market to develop it, aluminum producers have built capacity ahead of the immediate market. It is only by providing capacity adequate to supply still larger demands that the industry can most effectively develop new metalworking markets and encourage new large volume applications.

New Tungsten Process May Lead to Simple Shapes

F. A. McGonigle—Two tungsten processes researched by the U. S. Bureau of Mines are significant.

The first is a new and simple method of producing commercial powder. The tungsten mineral scheelite was used to produce powder of better than 99 per cent purity via a method referred to as fused-salt-bath electrolysis. The technique involves mixing the scheelite concentrate with alkali phosphates or borates. The bath is then heated and subjected to electrolysis.

The second advance is a tungsten material more than 99.99 per cent pure produced on a lab scale. The technique, say bureau scientists, makes possible the close control needed to produce tungsten tubing and other simple shapes.

With the advent of need for higher temperature alloys, there should be significant advances in the use of so called refractory metals. Tungsten is one of them.

MUNDT PERFORATED METAL MEANS PERFECT SCREENS

Specially Fabricated for ALL INDUSTRIES BY

CHARLES MUNDT & SONS

53 FAIRMOUNT AVE.
JERSEY CITY 4, N. J.
PHONE DELAWARE 3-6200

Send for Illustrated Catalog

Nonferrous Metal Production

J. S. SMART JR.
General Sales Manager
American Smelting & Refining Co.
New York

New Chrome Plating Techniques To Boost Zinc Consumption

J. S. Smart Jr.—In lead, it is probable that nuclear and newer military uses will account for more consumption than new civilian applications during the year.

In zinc, automotive consumption in the '60 models will increase because of new chromium plating techniques developed to solve corrosion problems experienced with decorative, diecast zinc components.

Four, new, continuous galvanizing lines are going in.

The aftermath of strikes in the ferrous and nonferrous industries will almost certainly extend into the early months of 1960. Domestic mine output of lead during 1960 may average 25,000 tons per month compared with 21,000 tons in 1959 and 22,000 tons in 1958.

In view of better demand for zinc, domestic mine production may increase to an average of 45,000 tons per month in 1960 compared with 35,000 tons in 1959 and 34,000 tons in 1958.

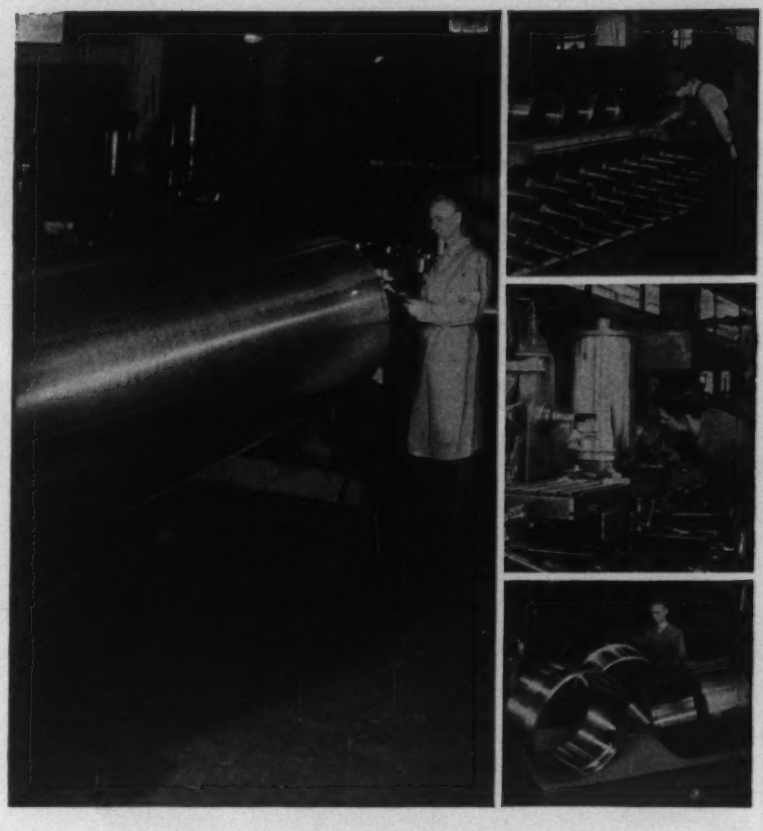
New Joining Techniques Boost Aluminum's Potential

Derek Richardson—The major market penetrations of aluminum in 1960 will be a direct result of outstanding new joining and finishing processes.

Improved adhesive bonding is one of the most exciting technical steps forward.

Conventional methods of joining have retarded progress toward maximum aesthetic appeal in the pleasure boat field. A hull with soft, flowing lines is most simply achieved by combining inert gas welding and adhesive bonding.

The new bonding techniques should



You'll find them better for pressure if they're

SHENANGO CENTRIFUGAL CASTINGS

WHATEVER the inside or outside pressures, Shenango centrifugal castings are better able to withstand them without failure.

Parts cast by the Shenango centrifugal process are much tougher because their finer, *pressure-dense* grain avoids stress concentrations while providing greater strength, better elongation and freedom from such costly defects as sand inclusions, blowholes and such.

Whether you need rings, rolls, sleeves, liners, bushings, bearings, mandrels or *any* annular or symmetrical part . . . ferrous or non-ferrous . . . in whatever shape, size or dimension to meet your requirements . . . Shenango can do the job. And do the job *better!*

For informative bulletins on the answers to your tough problems, it will pay you to write now to: *Centrifugally Cast Products Division,* The Shenango Furnace Company, Dover, O.

SHENANGO CENTRIFUGAL CASTINGS

COPPER, TIN, LEAD, ZINC BRONZES • ALUMINUM AND MANGANESE BRONZES
MONEL METAL • NI-RESIST • MEEHANITE' METAL • ALLOY IRONS

by INTERNATIONAL

(FORMERLY OF DAYTON, OHIO)

THE MOST RUGGED INDUSTRIAL CARS BUILT

INTERNATIONAL industrial cars, built by ERIE, are custom designed and fabricated to your specification, giving you an operating 'edge'. INTERNATIONAL'S carefully engineered features and 'know-how' minimize your maintenance costs.

For over half a century, INTERNATIONAL cars have been accepted as standard for all industry, so enlist this knowledge to help you effect definite savings. Contact an ERIE representative for more information on INTERNATIONAL'S plus values, costs, and dependability and plan now to standardize and specify the most rugged industrial cars built . . . INTERNATIONAL.

Send for this new informative Bulletin on two great cars.

INTERNATIONAL CLAY MACHINERY CO.

a division of ERIE ENGINE & MFG. CO.

DEPT. 1 955 EAST 12TH STREET ERIE, PA.

Nonferrous Metal Production

DEREK RICHARDSON
Vice President-Aluminum
Sales, Metals Div.
Olin Mathieson Chemical Corp.
New York

J. D. HANAWALT
Vice President
Dow Chemical Co.
Midland, Mich.

open up pleasing new visual and cost approaches in trucktrailer bodies, automotive assemblies, electrical substations, appliances, and utensils.

Perhaps equally important are the potentials for porcelain on aluminum in architecture. Porcelain finishes also lend themselves to appliances, electrical goods, and an endless chain of consumer durables.

Magnesium Wrought Products, Diecastings to Gain in '60

J. D. Hanawalt—Gains are expected in magnesium castings and wrought products this year.

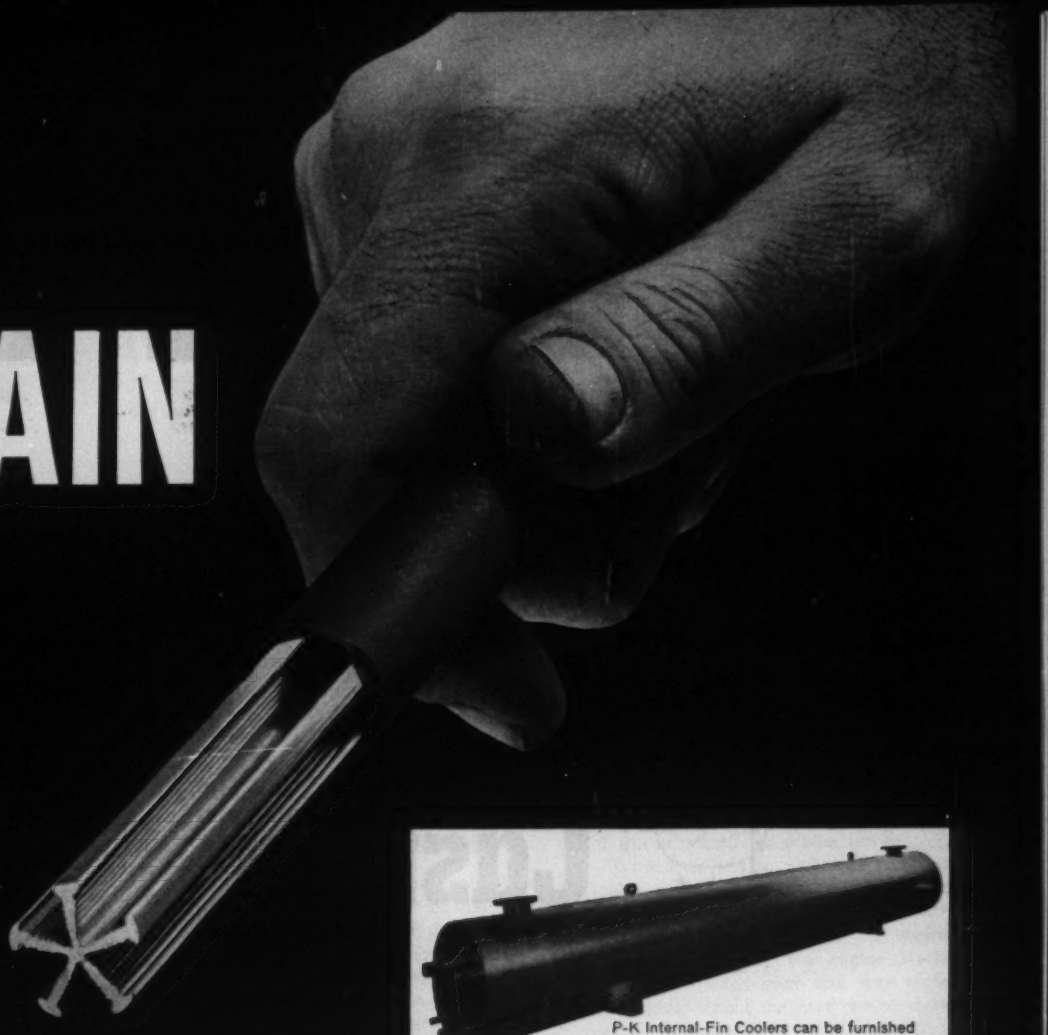
The cold chamber process with automatically metered feed of molten metal boosts the outlook for diecasting magnesium.

Product improvements include a new cold bending sheet from coil stock which in many cases eliminates the need for heated dies in making critical bends. Additional uses are expected to develop for ZE10A sheets, require no stress relief after welding and which are being used initially in bulk product shipping containers.

Increased use of the magnesium-thorium alloys in supersonic aircraft and missiles is expected.

Magnesium also continues its steady advance in military ground equipment where lightness is getting more emphasis.

AGAIN



P-K Internal-Fin Coolers can be furnished insulated with Rock Cork laid in asphalt and covered with a heavy steel jacket. Illustration shows insulated cooler.

Revere helps fit the metal to the job

AND PATTERSON-KELLEY CUSTOMERS SAVE 3 WAYS

Because of its unique design, the Patterson-Kelley Freon Water Cooler shown at right above saves space, requires less Freon, while its reduced weight and size mean lower cost.

With the P-K Type FO Internal-Fin Freon 22 Water Cooler the installation can be designed for a shell 2 diameters less and 1 to 2 feet shorter than with conventional plain or bare tube coolers. This is made possible by the use of ¾" O.D. x .035" gauge Revere copper tube drawn over a Revere aluminum extruded fin as shown above. Serrated surface of the fin enhances refrigerant vaporization.

By making both the tube and the extruded fin, and assembling them in the same plant a tight contact between the two metals is assured, thus establishing maximum heat transfer. Once again Revere has helped fit the metal to the job, money was saved and a more efficient product produced.

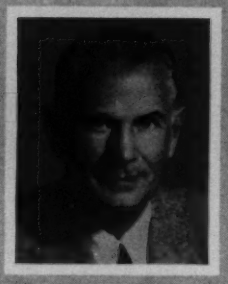
Why not consult with Revere's Technical Advisory Service and take advantage of its extensive knowledge in "fitting the metal to the job." This Service has saved others money, why not you?

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

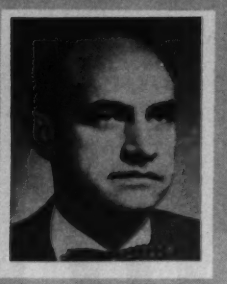
Mills: Rome, N.Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N.Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities. Distributors Everywhere.

JOHN LONGABAUGH
Chief Metallurgist
Outboard Marine Corp.
Waukegan, Ill.



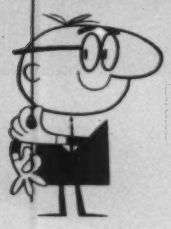
L. G. VANDERHOOF
Vice President
Stewart Die Casting Div.,
Stewart-Warner Corp., Chicago

JAMES H. SMITH
General Manager, Central Foundry Div.
General Motors Corp.
Saginaw, Mich.



JOSEPH H. CADIEUX
President
Casting Engineers Inc.
Chicago

1960 FORUM ON TECHNICAL PROGRESS



Casting

Vacuum Diecasting Handles New Alloys

John Longabaugh—Through the use of vacuum diecasting, materials like aluminum-magnesium alloys of high purity can be cast in production almost as readily as the standards, aluminum-silicon or aluminum-silicon-copper alloys. Use of the new alloys will be greatly increased when design engineers are aware of their excellent tensile and yield strengths with tremendous increases in elongation and impact properties.

Vacuum diecasting is not the answer to all problems encountered in this phase of casting, but it is a helpful tool in producing more intricate castings, and the process opens the door to new and improved alloys.

Predicts Acceptance of Diecasting as a Science

L. G. Vanderhoof—The immediate future will bring improved diecasting operational features. Some—automatic cycling, vacuum systems, metal handling, and temperature controls—are being released for wider industry applications now. Others of even greater complexity will follow.

The widespread appearance of both larger and smaller diecasting machines is indicative of the continuous development efforts of our industry.

Ultimately, process and equipment improvements should solve the greatest problem we now face: Getting diecasting accepted as a science.

Automakers Adopt Castings For Variety of New Jobs

James H. Smith—Automotive manufacturers taking a new look at castings are finding possibilities of important cost savings over other methods of shaping metals. As a result, cast automotive parts have been adopted in significant new applications.

The use of automotive crankshafts cast of pearlitic malleable iron in a 1960 model V-6 truck engine marked an application breakthrough. The crankshafts have proved equal to the task in every respect while offering freedom of design and substantial savings.

Castings are performing new functions in front wheel suspension systems on two lines of 1960 trucks. Pearlitic malleable iron castings are used as upper control arms, upper control arm brackets, and torsion bar adjustable arms—all critical applications requiring exceptional strength, durability, and reliability.

Castings are being designed with the aid of stress analysis to eliminate the last ounce of unnecessary metal. Closer dimensional tolerances are being held, substantially reducing the machining required. Better metals with more consistent quality have resulted from improved metallurgical controls. Larger, faster molding machines produce more and better castings. Modern heat treating methods make it possible to tailor the castings to desired hardnesses.

Metals Unknown Until Recently Are Being Investment Cast

Joseph H. Cadieux—In the aircraft and missile fields, investment castings are becoming larger, more intricate, and made of exotic alloys unheard of only a few years ago. The most important recent developments in aircraft castings are vacuum melting and ceramic shell casting. Several companies have used precast ceramic cores to cast blades and vanes with in-

JOHN W. BROPHY
President
Prenco Products Inc.
Royal Oak, Mich.

T. E. EAGAN
Chief Research Metallurgist
Cooper-Bessemer Corp.
Grove City, Pa.

ALFRED F. BAUER
Asst. Gen. Mgr. & Chief Engineer
Doehler-Jarvis Div., National Lead
Co., Toledo, Ohio

J. DONALD ZAISER
President
Ampco Metal Inc.
Milwaukee

ternal cooling passages, a feat formerly considered impossible.

An almost unbelievable demand for investment castings has developed in the commercial field. The castings are much smaller than those for aircraft applications. They sell at low prices to meet competition from other fabricating processes.

Recent developments in pattern production, dip coat and investing formulations, and other techniques have produced commercial castings of improved quality, particularly as they relate to truly small parts (less than 1 cu in.).

The tiny parts are further refined through secondary operations such as sizing and coining to yield finished parts with closer tolerances than are possible within conventional investment casting techniques and at costs previously unattainable.

Casting Impregnation Expected to Go Places

John W. Brophy—Trends indicate a boom in casting impregnation. It can be attributed to the removal of the human element from testing equipment; recognition by producers that microporosity is inherent in all castings; and use of more aluminum castings, thinner walls, higher operating pressures, and more complicated casting design.

Most important is the trend toward more automation in the testing of pressure vessel castings. The modern test apparatus is fully automatic. It subjects the casting to critical inspection and automatically marks those failing to measure up to a predetermined standard. It is no longer possible for the leaker to go undetected.

The trend toward recognition of microporosity in casting walls as an inherent characteristic means less resistance to the concept of impregnation among casting producers.

We can expect: Greater emphasis on guaranteed results among casting producers or users who engage outside processors; a trend toward economical and permanent metal oxide sealants; and a growing popularity in leased impregnation equipment.

New Gray Iron Standard Takes Bulk Out of Design

T. E. Eagan—One severe criticism of gray iron by design engineers is that tensile properties are controlled by separately cast test bars. They do not tell accurately what the tensile properties of the casting itself may be; thus the designer must use large safety factors which result in components that are bulkier then those made of other ferrous metals.

A step in the right direction has been made by Committee A-3 of American Society for Testing Materials. Now the designer can at least designate tensile strength and the size of test bar, which will give him some assurance that the tensile of the casting is what he desires. In addition, the length of the test bar has been shortened to assure soundness.

The production of nodular iron continues to increase each year. The rising use of plunging of the magnesium alloy is a significant trend. But the method is somewhat wasteful and tends to influence the cost of production, which suggests that methods to eliminate waste are needed.

Diecasting Improvements Open Potential Market Areas

Alfred F. Bauer—Aluminum diecastings are being used for a large percentage of the 1960 automotive transmission housings. Since they combine lightness with high strength, accuracy and economy so advantageously, we expect gradual change of all such housings of large production potential to diecast aluminum.

In 1959, several hundred six cylinder engine blocks were aluminum diecast and a large number of them field tested in cars with good results. The Bimetallic Interlock Bond for casting gray iron sleeves into the aluminum engine block, and the transplant coat method to protect the cylinder bores with a thin layer of wear-resistant material, are considered major breakthroughs in the development of diecast aluminum engine blocks.

With most of the technical problems under control, diecast six cylinder engine blocks will be introduced on a production basis in 1960. Diecast V-8 engine blocks and compact V-6 engine blocks are in the design stage and may make their debut within the next two to three years.

Magnesium diecasting's growth in portable tools, office, and optical equipment will be overshadowed by the efforts of the magnesium industry to get a foothold in automotive applications.

Thinner walls have brought zinc diecastings again into a competitive situation and improved plating methods have improved their corrosion resistance so much that a large number of radiator grilles for the 1960 cars appear again as plated zinc diecastings.

Brass, Bronze Casters Boost Competitive Ability

J. Donald Zaiser—For a time, development and aggressive sales promotion of alternate production methods seemed to have caught castings producers off balance. The possibility of widespread substitution spurred increased efforts on the part of the nation's brass and bronze casting producers to counterattack through modernization, development, and the education of users.

Better melt quality through the use of improved deoxidizers and closer control of furnace atmospheres will assist the foundry in producing better quality castings. Wider use of castings should con-

Casting

C. K. DONOHO
Chief Metallurgist
American Cast Iron Pipe Co.
Birmingham

G. E. SEAVOY
Vice President
Whiting Corp.
Harvey, Ill.

HARRY W. DIETERT
Chairman
Harry W. Dietert Co.
Detroit

D. L. COLWELL
Vice President
Apex Smelting Co.
Cleveland

tinue because of better casting appearance, closer tolerance, and greater uniformity made possible by pressure molding, shell casting, the investment process, CO_2 cores, improved sand control, and better molding materials.

Increasing use of modern inspection techniques, such as ultrasonic testing and gamma ray or X-ray, will provide further safeguards of quality.

An important area of necessary breakthrough for the copper-base foundry industry appears to be adequate education of users as to the qualifications of various alloys so these materials may be properly selected and applied.

Precision Is the Goal For Gray Iron Casters

C. K. Donoho—The aim of the gray iron castings industry must be toward better quality at lower cost. An essential quality factor is in casting to lower tolerances, with smoother surfaces, and less need for machining. Those things will be done by better and more precise equipment. Increased use of shell molding methods, CO_2 bonded molds and cores, and other newer molding processes will result in more accurate castings. More rigid molds, which eliminate mold wall movement during freezing, provide markedly improved soundness.

Cost reduction will be achieved by more mechanization of molding, casting, and cleaning operations. New materials, such as plastic binders, CO_2 hardening binders, and cold setting core binders can also save time and money. Centrifugal casting processes for tubular products are readily adaptable to advanced mechanization.

A primary technological problem is the need to reduce the cost of molten iron. Increased costs of pig iron and coke have caused an upward spiral in the cost of metal. The basic lined cupola allows use of a higher proportion of steel scrap to produce gray iron. Under active investigation are various direct reduction processes to enable foundrymen to produce their own iron directly from ore.

Three Trends Help Foundries Meet Rising Competition

G. E. Seavoy—Steel and iron foundries are confronted with increasing competition from aluminum forgings, weldments, and plastics. Also, there is encroachment on domestic markets by foreign suppliers.

Lower costs by improved methods and equipment are the only answer, assuming competent marketing efficiency. Among the ways this may be attained are:

1. Use of basic slag-operated cupolas with water cooling and preheated air to permit use of all scrap mixtures.

2. Further duplexing in electric furnaces or fuel-fired furnaces to control uniformity and obtain high quality.

3. Since material handling is a big part of any metallurgical operation and hence a costly factor, the installation of the most efficient, labor saving mechanical equipment is a must. An example might be the new hydraulically operated crane with infinitely variable control.

Casting Surfaces Improved By Recent Advances

Harry W. Dietert—New molding materials may be classified as exterior or interior casting surface molding materials.

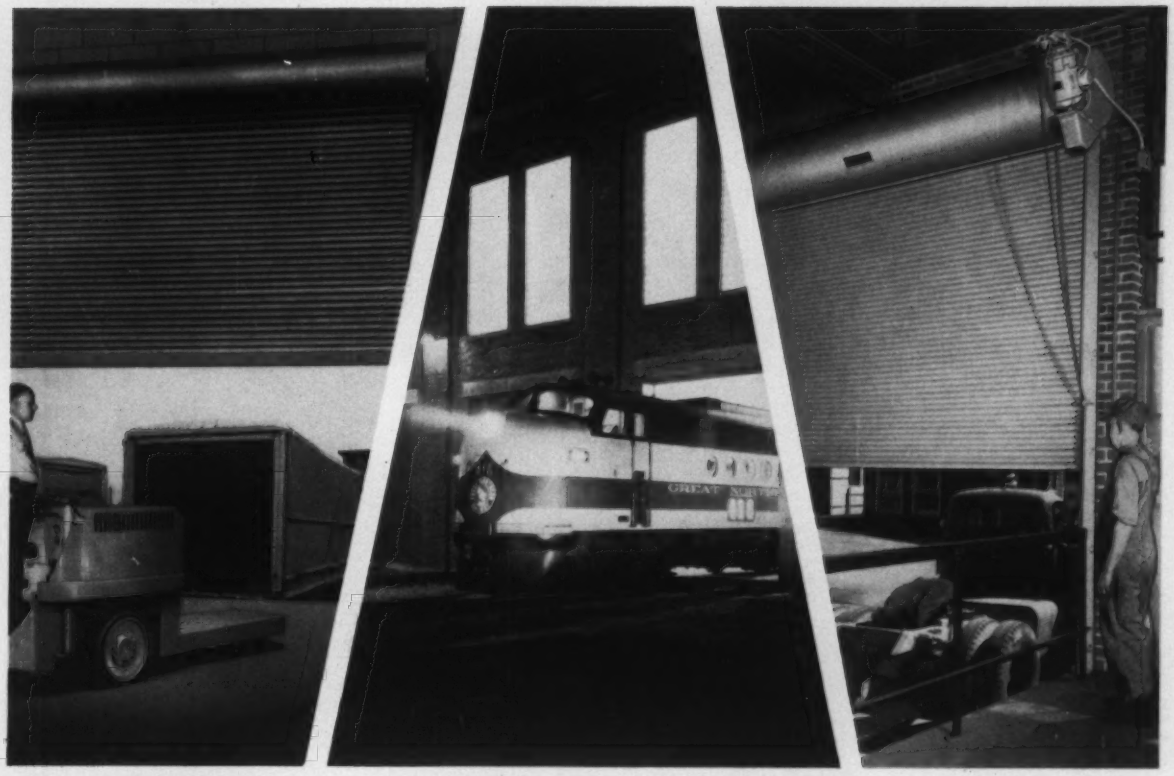
Molding materials producing superior exterior casting surfaces are bentonite-oil bonded sands and polymer bonded sands where no water is employed in the molding material and the mold atmosphere is reducing in nature. Shell molding materials containing inhibitors to control mold atmosphere at the metal-sand interface are producing steel and malleable castings of superior finish and dimensional accuracy.

New processes and new materials provide interior casting surfaces with fine finish and dimensional accuracy. Small to medium size castings receive superior interior surfaces from either the shell core or gas-set bonded core process. In both processes the core is cured and hardened in the corebox, making for a high degree of dimensional accuracy. Interior surfaces of large castings are being produced accurately with the air-setting core binder process.

Two-Piece Beer Keg Made With New Casting Process

D. L. Colwell—Methods of applying vacuum to dies to remove all air and vaporized lubricants have resulted in improved zinc base diecastings and superior finishes on aluminum diecastings. In some instances the vacuum process has led to the successful casting of pure aluminum and anodizable aluminum alloys, both difficult to cast without vacuum.

Interest continues in aluminum diecasting alloys which can be anodized in the natural finish or in light colors. A new aluminum zinc alloy which anodizes beautifully is on the market. It has castability superior to that of the pure aluminum and aluminum-magnesium alloys—although it's not quite equal to the popular aluminum-silicon-copper alloys. Suitable die steels seem to be the greatest handicap in diecasting. Improve-



Cut "In-And-Out" Handling Costs with KINNEAR Steel Rolling Doors

In your search for proved ways to cut costs and speed up operations, have you considered the gains you can make "door-wise"?

For example, Kinnear Doors *save time* by clearing the entire opening in a single, easy, upward action. Then they *stay out of the way,* coiled compactly overhead, until closed.

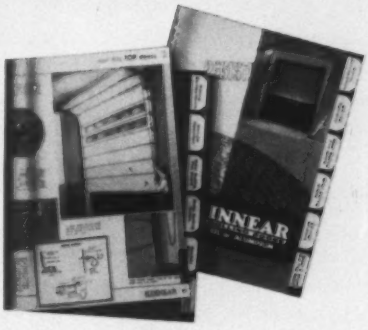
In addition, all floor and wall space around a Kinnear Rolling Door is *fully usable at all times.* You can stack "mountains" of materials close inside or outside the door curtain — ready for fast, through-the-door handling by the shortest route.

And because ceiling space is always clear *above* Kinnear Rolling Doors, you get more efficient use of cranes, hoists, conveyors, and other handling equipment. In fact, Kinnear Rolling Doors can be equipped to open and close *around* crane or hoist rails that run right through the doorway.

Rugged all-metal construction plus heavy galvanizing* give Kinnear Rolling Doors extra ability to stand up longer under hard, daily use—through all kinds of weather. And you get more protection against fire, theft, intrusion and vandalism with Kinnear Rolling Doors.

Kinnear Doors are built to fit any new or old doorway. Electrical, manual or mechanical operation to meet *your* need. Write for full information.

*(with 1.25 oz. pure zinc per sq. ft. of metal, ASTM standard)



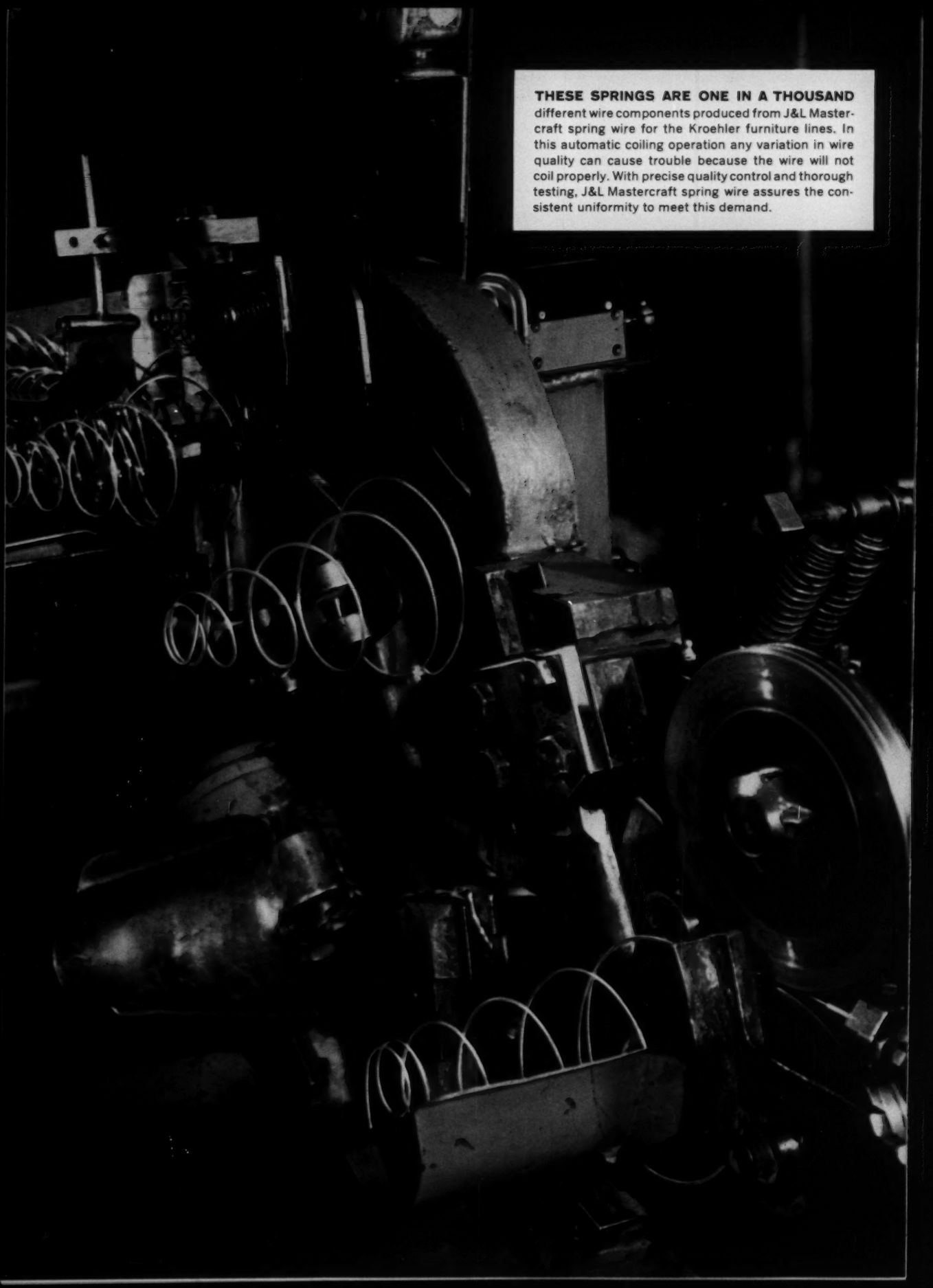
Kinnear RoL-TOP Doors (Sectional-Type) Are Also Available

Among the line of Kinnear Rolling Doors and Grilles described in this catalog you'll find details on the Kinnear RoL-TOP Doors — the door composed of rugged, heavily galvanized sections, hinged horizontally (available also with wood sections). For "Saving ways in Doorways", it will pay you to have this catalog on file.
Send for copy *today.*

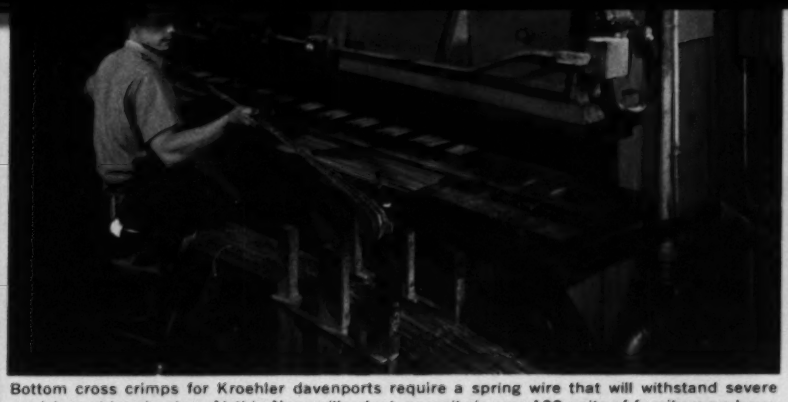
The KINNEAR Manufacturing Co.

FACTORIES:
1780-1800 Fields Avenue, Columbus 16, Ohio
1742 Yosemite Ave., San Francisco 24, Calif.
Offices and Agents in All Principal Cities

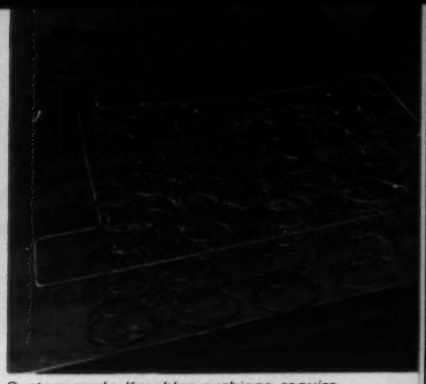
Saving Ways in Doorways
KINNEAR
ROLLING DOORS



THESE SPRINGS ARE ONE IN A THOUSAND different wire components produced from J&L Mastercraft spring wire for the Kroehler furniture lines. In this automatic coiling operation any variation in wire quality can cause trouble because the wire will not coil properly. With precise quality control and thorough testing, J&L Mastercraft spring wire assures the consistent uniformity to meet this demand.



Bottom cross crimps for Kroehler davenports require a spring wire that will withstand severe punishment in crimping. At this Naperville plant, capacity is over 100 units of furniture an hour.



Custom-made Kroehler cushions require many components made from J&L wire.

Spring wire cones, crimps, links and side wires are assembled on carefully fitted sofa frames.

Layers of rubberized sisal, burlap, cotton and top fabric are applied to seat frame assembly.

A skilled operator applies finishing touches to this Kroehler chair.

Over 400 separate items of furniture are produced for the Kroehler and Valentine Seaver lines by 17 plants in the U.S. and Canada. Helping to uphold the Kroehler reputation for fine furniture are the many spring wire components produced from J&L Mastercraft wire.

Report from the world's largest furniture maker...

"We reduce rejects, machine downtime and waste with J&L Mastercraft spring wire"

. . . Kroehler Manufacturing Company

"We've never had to remove a J&L Mastercraft coil from a machine . . . never had to call in J&L to solve a wire deficiency problem.

"Our machine operators are sold on J&L wire. The uniform physical properties of Mastercraft spring wire result in more uniform production runs, with fewer machine adjustments. Also, J&L's special spring wire finish does not foul our machines. That means fewer shutdowns for equipment cleanup."

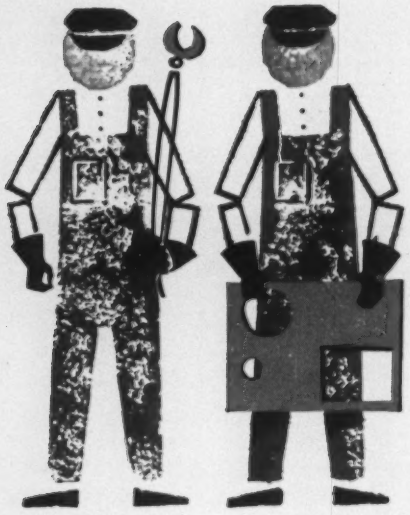
Similar facts are reported by many other automatic spring-making operators. Reduced rejects, increased production are achieved because every coil of Mastercraft, hard-drawn MB or Electromatic oil-tempered MB spring wire is quality controlled, completely tested.

Try this superior J&L product. It's tops in quality, competitive in price. Contact your nearest J&L district office, or write to Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

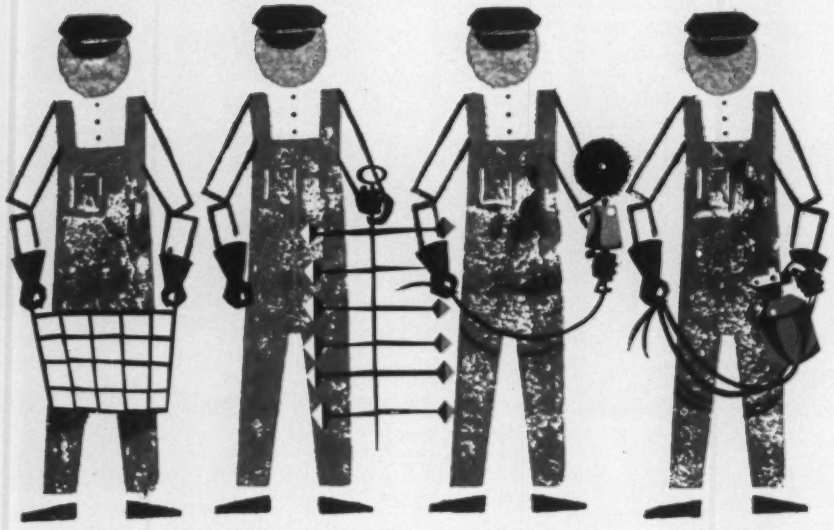
Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

ALL UNDER ONE ROOF AT BROWN-LIPE-CHAPIN



DIE CASTING METAL STAMPING



ANODIZING NEW DURA-PLATE ELECTROPLATING POLISHING PAINTING

Everything's done on virtually one continuous assembly line—from die casting or metal stamping to the gleaming finished part.

Every process is under one roof: Extensive facilities for precision die casting parts of any shape and sizes up to six feet in length . . . an array of presses for stamping parts of any metal . . . complete facilities for rolled sections . . . and efficient assembly line processes for polishing, anodizing, painting and electroplating with new Dura-Plate.

Two plants, strategically located in Syracuse, New York and Elyria, Ohio, offer the same complete, under-one-roof facilities to speed delivery of your parts to meet your schedules right on time. So whatever your product, write or phone Brown-Lipe-Chapin, Syracuse, New York for prompt information.

GM GENERAL MOTORS RELIABILITY by BROWN·LIPE·CHAPIN BLC

DIVISION OF GENERAL MOTORS CORPORATION

ment has been made in the use of pure molybdenum coatings and of higher-molybdenum-content die steels, but more progress is required before aluminum and copper alloys can obtain a die life equivalent to that of the zinc diecasting dies.

Hypereutectic aluminum-silicon alloys make a tremendous contribution to the possibility of diecasting auto engine parts. The permanent mold process is already in use for small engine pistons containing either Vanasil or Red X-20 with silicon contents of 20 per cent or more and has great possibilities for automotive engines. Initially, the hypereutectic will probably be used in an inserted sleeve on automotive engines, but its improved machinability makes a whole block a possibility.

The diecasting and permanent mold fields are growing closer as certain aluminum diecastings have gone back to low pressures, and certain permanent mold castings are beginning to use positive pressure greater than gravity. A process with about 5 lb pressure (which may be called either diecasting or permanent mold) has been used to produce beer kegs in two pieces and is also being used for large, automotive parts—such as automatic transmission housings, cylinder heads, and cylinder blocks. The process combines the directional solidification of a permanent mold casting with the more rapid production of diecasting.

Ferrous Casting Research Aimed at Three Goals

Hans J. Heine—Metallurgical research, especially in the ferrous castings area, will center on these fundamental questions:

1. What is the ultimate that can be done with a cast metal part on the bases of design adaptability, cost factors, and ultimate properties desired?

2. How can the technical societies and trade associations consistently help the foundries upgrade the product?

3. How can technical research assist the foundry industry to get a better return on its investment?

We will make better use of both sand and metal molds and casting processes utilizing a controlled rate of heat transfer (directional solidification). Application of the latest developments in vacuum melting and pouring, coupled with an adaptation of benefits derived from radioactive isotopes, should have a major impact on the tonnage of castings produced in the years to come. Use of synthetic resins for pattern equipment will increase.

Closer control over minor impurities and a better understanding of the effect of trace elements, either singly or in combination, on mechanical properties and annealability of malleable iron, will have spectacular results, enhancing the application of malleable iron in construction.

Intensive work is also being carried out to make present specifications reflect the optimum that can be obtained with respect to properties and to improve our knowledge of the shape relationship in casting design.

We will witness a continued growth in the annual tonnage of oil-quenched and alloyed pearlitic malleable iron of exceptional mechanical properties, coupled with a concomitant increased public awareness of the reliability, quality, and economy of cast components.

Developments Will Widen Diecasting Markets

David Laine—Nineteen sixty should see a continuing rising volume of diecasting output.

Several developments will materially aid custom diecasters in widening their markets. Improvements in production techniques effected by the developments of the Die Casting Research Foundation will extend application areas. Of particular importance has been the development of a compatible vacuum diecasting method designed to meet the needs of custom shops. Included are alternate vacuum systems which can be used on either zinc or aluminum diecasting machines and which can be adapted to existing or new dies with minimum expense.

Further impetus is provided by the variety of new processes for plating zinc diecastings announced at an American Zinc Institute symposium in Detroit. They hold promise of increasing the beauty and further increasing the outdoor service life of chromium plated zinc diecastings and will undoubtedly result in additional applications in the automotive and other major consuming fields.

Aluminum Casters Continue Courtship of Auto Market

D. L. Lavelle—The greatest growth expected in aluminum castings in the near future is in the automotive industry. A significant breakthrough has been made with the commercial production of an engine consisting principally of aluminum castings produced in permanent molds. Development work is being pushed on diecast cylinder blocks and commercial production is expected. The use of both diecast and permanent molded aluminum transmission housings and other related parts is now commonplace. An integrally cast wheel, hub, and brake drum is available as optional equipment on one 1960 model. Truck manufacturers are using more and more aluminum castings as the demand for decreased weight and higher payloads increases.

Casting

HANS J. HEINE
Technical Director
Malleable Founders' Society
Cleveland

DAVID LAINE
Secretary
American Die Casting Institute Inc.
New York, N. Y.

D. L. LAVELLE
Central Research Laboratories
American Smelting & Refining Co.
South Plainfield, N. J.

Higher quality aluminum diecastings are being made with evacuated dies, but advances with this technique have not been as rapid as with zinc. The search for a better anodizable diecasting alloy continues under pressure from the automotive and hardware industries.

Large diecasting machines with 2000 ton locking pressures should promote interest in much heavier aluminum castings. Castings weighing up to 75 lb will no doubt be produced.

In the sand and permanent mold foundries, cores bonded with resin, oil, and carbon dioxide, and the shell process are

Casting

HARRY M. ST. JOHN
Consultant
Ft. Pierce, Fla.

RAY SUTTER
President
Sutter Products Co.
Holly, Mich.

E. J. METZGER
President
Multi-Cast Corp.
Wauseon, Ohio

CHARLES W. BRIGGS
Technical & Research Director
Steel Founders' Society of America
Cleveland

providing lower costs, better finishes, and closer tolerances than formerly possible. Improved melting methods, and particularly the control of the gas content of melts, is improving the general quality and uniformity of aluminum castings.

Several producers have announced new aluminum alloys which provide high ductility in sand and permanent mold castings, age-hardenable diecastings, diecastings with bearing qualities, and a high magnesium, heat treatable alloy having improved foundry characteristics and lessened sensitivity toward stress corrosion.

Capital Investment of $15,000 Per Worker Is Justified

Harry M. St. John—Two factors are primarily responsible for the marked changes which have been taking place in the foundry industry: Technological advances and the rapidly increasing cost of labor. To be competitive, the foundry must adopt as much labor-saving equipment as its financial means will permit. A capital investment of $15,000 for each workman whose labor can be saved seems justified.

The greatest potential for labor saving is in the handling of materials, molds, and castings. Automatic molding is not for the small foundry, but conveyors can make a great saving without too costly an investment. Overhead delivery of sand to the molder is a must.

The brass foundryman has learned that advantages inherent in shell molding can be duplicated at less cost in green sand by the use of harder molds and closely controlled improved sands. More perfect castings must be made to meet the requirements of modern tools in the machine shop. Cored holes must be exactly centered, finishes reduced, and surface defects eliminated.

Although many foundries meet requirements with naturally bonded sands, often blended with sands which are almost clayfree, the use of synthetic sands will continue to increase. Additives, to promote flowability and elasticity of the sand, will be more widely used.

Many brass foundries are still remiss in temperature control. They have pyrometers, good, bad, or indifferent, but their determinations are far from precise in these areas: Best temperatures for individual castings, allowances for cooling time, and the number of molds which can safely be poured. Successful foundries will make a practice of close controls and good statistical records on which controls can best be based.

Makers of Equipment, Materials Must Work Together Now

Ray Sutter—Production materials being evolved by other industries have more to do with foundry equipment design than normal factors such as pressures, stress and strain of materials, bearing life, and heating. We must work closer than ever before with people who not too long ago were unrelated to our type of business.

This year will see considerable decrease in the cost of castings, and the following two or three years will see process changes that will greatly affect quality, cost reduction, and new applications.

Equipment builders and users must cooperate fully in the exchange of ideas, so they can more intelligently bring about needed changes.

Part Quality and Eye Appeal: Jobbers' Sales Challenges

E. J. Metzger—The small nonferrous jobbing foundry is being challenged as never before. There is an increasing demand for higher strength alloys for special applications. For competitive reasons, there also is a challenge to produce the conventional alloys to maximum and consistent physical standards. Close control must be maintained in all stages of production, including metal handling and alloying, melting under controlled atmosphere and temperature, and feeding and gating.

We foresee increasing competition in all types of manufacturing. As a jobbing foundry without a product, we are not up against foreign competition. However, many of our customers must face competition from abroad, as well as an overcapacity of some products in this country. Most manufacturers are alert to such forces and are mechanizing their operations and eliminating cost where possible.

Never before has so much emphasis been put on the product's eye appeal. Castings are strong competitors since they can be designed to combine function and pleasing appearance.

Steel Foundries Step Up Their Research Activities

Charles W. Briggs—Steel foundries have been developing brittle lacquer and strain gage techniques to help their customers design parts.

The designing of heavy walled steel castings of 4 to 12 in. for critical services, such as atomic power and high temperatures, is being promoted through the preparation of reference radiographs. One phase in the preparation of the specifications is nearing completion. During the last year, information was obtained on steel castings of 200,000 to 300,0000 psi tensile strength. Additional studies are expected to be completed this year.

Case Institute of Technology is doing extensive work on different commercial

Contact one dependable source for non-ferrous supplies... FEDERATED.

You have the most comprehensive line of available non-ferrous materials to select from. Through the widest variety of products, the most stringent production controls, and the most experienced and extensive application assistance—Federated is *your* supply headquarters for: Non-ferrous casting metals, aluminum, copper base, zinc base; Solders, Babbitt metals; Lead products; Plating anodes and chemicals; Low melting alloys; Galvanic anodes; Type metals; Zinc dust. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

Casting

EINAR A. BORCH
Executive Vice President
National Metal Abrasive Co.
Cleveland

CHESTER V. NASS
Vice President & General Manager
Beardsley & Piper Div.,
Pettibone Mulliken Corp., Chicago

steel castings. Results of destructive and nondestructive tests on the entire casting are compared with those of test bars to illustrate the effect of design on mechanical properties.

Collective research for the steel foundry companies is continuing. Studies include: The solidification of 12 in. thick section steel castings; surface characteristics of various types of steel castings; investigations of close packing of sands and development of effective clay bonds; inorganic bonding of molding materials; the effect of section design on casting production; and corrosion of cast steels.

Better Customer Communications Planned by Foundry Industry

E. A. Borch—Technological developments in casting will come at an even faster rate in the sixties. All foundry associations are making an all-out effort to recapture lost markets and to gain new ones.

Equally important is the task of creating an awareness and appreciation among consumers that the developments are available. The foundry industry will tell its story via such media as product design studies and design clinics, sales training clinics, and industry-wide advertising programs.

The effectiveness of the program is already apparent. More and more men in metalworking are taking advantage of castings. Successes with the new, improved products are spurring foundry operators into accelerating their research for technological improvements.

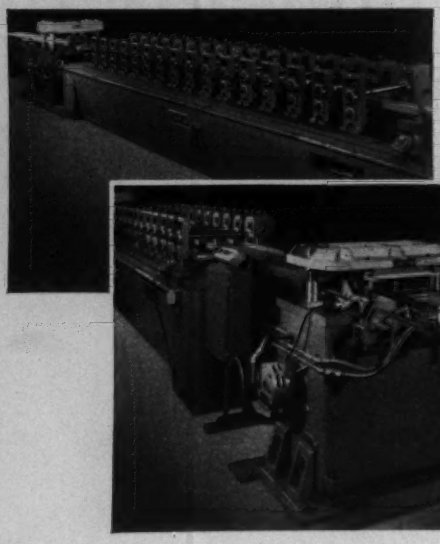
Casting Refinements Boost Chances for Broad Growth

Chester V. Nass—Several new casting methods, materials, and processes have undergone evaluation and are finding their proper application in the foundry industry. Machinery designed and developed for the most advantageous use of the new materials and methods has been developed and proved.

More engineering talent, a necessity for the small as well as the large foundry, is being brought into the industry. More is needed, but it is significant that the industry recognizes this.

Improved tolerances and finishes of castings, previously considered attainable only through special processes, are being obtained through conventional methods.

New developments for the semiautomatic and automatic molding and blowing of molds and cores are in the proving stage and will be available in the near future.



Roll Form Coil Stock

•

BY THE MILE

Fully coordinated roll forming production lines, such as the above Ardcor installation, produce finished products on a miles-per-day basis.

Here an embossed, aluminum section of .019" stock is being formed by a leading aluminum manufacturer at a rate of 200 ft. per min. An Ardcor Prenotch Press, lower photo, and an Ardcor Cut-Off Press, upper left top photo, complement the high performance of the popular Ardcor 1-F Roll Forming Machine.

Ardcor can furnish complete roll forming lines for a wide variety of shapes and sizes—to customer specification.

Let us evaluate the greater production possibilities of your products. Write us.

American **ROLLER DIE CORP.**
29520 Clayton Avenue Wickliffe, Ohio

ARDCOR

DESIGNERS, ENGINEERS AND BUILDERS: Single Roll Forming Machines or Completely Automated Production Lines for Cold Forming, Ferrous and Non-Ferrous Electric Weld and Lock Seam Tube Mills • Forming Rolls, Tubing and Pipe Rolls • Straightening, Pinch and Leveller Rolls • Cut-Off Machines • Slitters

casting soundness can be controlled

Avoid risk of hidden defects . . . specify Meehanite castings

In castings of varying sizes and sections the control of metal structure is of paramount importance in preventing porosity and deviations in physical properties. Meehanite metal's dense, fine grain structure which assures casting solidity . . . free and easy machinability . . . and consistent physical properties regardless of mass or section is achieved by patented manufacturing methods quite unique in metallurgical control.

The uniform soundness of Meehanite castings is predictable in advance . . . in every casting . . . in every group of castings. You can depend on Meehanite to save you time and money in your shop and to enhance your products reputation in the field.

Avoid the risk of hidden defects which result in high machining costs and time loss. Don't take a chance on bargain prices or so-called "equivalents." Specify Meehanite castings and be free from worry. Whatever your casting requirements, there is a nearby Meehanite foundry ready to serve your needs.

For additional facts about Meehanite®, write to the Meehanite Metal Corporation, 714 North Ave., New Rochelle, New York, for your free copy of *Meehanite Means Better Castings.*

MEEHANITE METAL

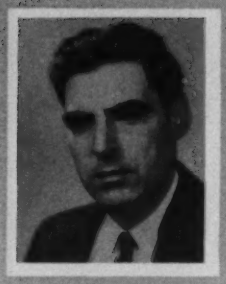
The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington, N. J.
Casting Service Corp., LaPorte, Indiana and Bridgman, Michigan
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
Dayton Casting Co., Dayton, Ohio
Empire Foundry Co., Tulsa, Okla. and Bonham, Texas
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundries, Inc., Chicago, Ill.
Hamilton Foundry, Inc., Hamilton, Ohio
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Lincoln Foundry Corp., Los Angeles, Calif.
Nordberg Manufacturing Co., Milwaukee, Wis. and St. Louis, Mo.
Oil City Iron Works, Corsicana, Texas
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Foundries of FMC, Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Vulcan Foundry Co., Oakland, Calif.
Washington Iron Works, Seattle, Wash.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

MEEHANITE METAL CORPORATION, NEW ROCHELLE, NEW YORK

C. L. HARDY
President
Joseph T. Ryerson & Son Inc.
Chicago

W. G. DAHL
Vice President, Sales
Latrobe Steel Co.
Latrobe, Pa.

C. E. ROBERTS
Sales Manager, Alloy Steel Div.
Republic Steel Corp.
Cleveland



J. H. BECHTOLD
Manager, Metallurgy Dept.
Westinghouse Electric Corp.
Pittsburgh

1960 FORUM ON TECHNICAL PROGRESS

Materials and Metallurgy

Quality Steel Essential For Prestressed Concrete

C. L. Hardy—The structural dependability, economic advantages, and design flexibility of prestressed concrete is best attested by the record of its first decade of use in the U. S.

Seldom has the steel industry played as important a part in shaping the destiny of a new product. The ability of the industry to produce the special high strength steels needed to develop and hold the great forces involved was a prime factor in making the dynamic new construction material.

Hundreds of bridges, buildings, and other structures made possible with prestressed concrete are now part of the American scene. In my opinion, their number will increase substantially in coming years.

Space Age Demands Lighter, Tougher Metals

W. G. Dahl—The era of missiles, satellites, and jet aircraft poses an ultimatum to the metals industry. It must come up with lighter, tougher materials to withstand temperatures of extreme elevation.

Expanded production facilities for consumable electrode vacuum arc furnace melted alloys have fed critical missile and jet aircraft applications, including structural components as well as high temperature bearing assemblies.

Conventional tool and die steels are also being improved. High speed steels with uniform carbide distribution for unusual tooling applications aimed at longer tool life are an important contribution. Free machining, high alloy die steels are showing substantial diemaking economies and increased production runs. Improvements have been made on hot work die steels with the introduction of free machining grades and prehardened, machinable steels.

Vacuum Melting Will Boost Alloy Properties, Quality

C. E. Roberts—During the last several years considerable emphasis has been placed on steel cleanliness as indicated by the amount of nonmetallics or inclusions. This has been particularly true in steels for bearings and high stressed aircraft parts, as well as numerous military applications. We look for increased emphasis on cleanliness.

In the production of alloy and stainless steels, melting in vacuum can minimize the final gas and inclusions in the product. Through the use of consumable electrodes melted under vacuum, steel is being produced with extremely low gas and inclusion content. The high degree of cleanliness has led to strengths and ductility formerly considered impossible in normal operations.

Steel with tensile strengths of more than 300,000 psi and some ductility is being produced, and it is not unreasonable to look forward to the 400,000 psi level in the next few years.

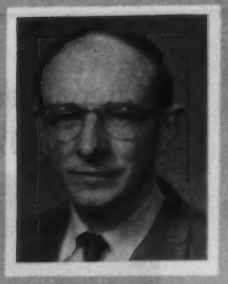
Nuclear Energy Concepts Are Far Ahead of Materials

J. H. Bechtold—In the 1950s, advanced thinking in the electrical power generating industry was centered on the economical conversion of nuclear energy to electric power. It involved the substitution of a nuclear heat source for conventional chemical heat sources. Otherwise, most conversion schemes followed traditional concepts and required a variety of me-

BRUCE E. BRENNAN
Director, Technical Information
Product Development Div.
Reynolds Metals Co.
Richmond, Va.

J. H. KEELER
Section Manager
Metallurgy & Ceramics Research Dept.
General Electric Co.
Schenectady, N. Y.

W. B. PIERCE
Vice President
Allegheny Ludlum Steel Corp.
Pittsburgh



ROBERT S. BUSK
Head, Metallurgical Laboratory
Dow Chemical Co.
Midland, Mich.

chanical rotating equipment, using a molecular gas or liquid.

The 1960s may see a more radical departure from the traditional. First, there will be a major attempt to substitute an electron gas for the conventional molecular gases as the working medium in both conventional and nuclear energy conversion equipment. Work is well into its initial phases.

Electronic methods of energy conversion introduce new material problems. As in conventional energy conversion equipment, the working medium must go through compression and expansion. Future "turbine and compressor blades" or "pistons" must compress or allow expansion of electron gases rather than molecular gases. New material concepts and new types of materials will be required. The materials for electronic heat engines will bear about as much resemblance to steels and superalloys as a nuclear fuel element does to coal.

Processing Methods, Coatings Will Extend Aluminum Usage

Bruce E. Brennan—Look for greater use of thin wall, pressuretight, intricate design aluminum diecastings produced under vacuum. The fine surface finish and lack of porosity make it practical to porcelain enamel or to chemically brighten and anodize for high quality appearance.

Tubed sheet—the forming of tubes within sheet—has changed the methods of refrigerator and freezer manufacture. The tubes can be varied in size, either round or flat on one side and designed in extremely complex patterns. The method holds great interest for integral stiffening, heat transfer, and a variety of complex assemblies.

Explosive forming of aluminum products has many interesting aspects that can be influential in advancing usage of the metal.

Advances in extrusions have been most prominent in general purpose use and in medium sizes. The giant extrusion presses have yet to attain major significance. Practical variation of wall thickness adds a wider dimension to the process.

Flexible enamels on coiled sheet and wire add economical color to the corrosion resistant metal. Coatings of plastisols and organosols have decorative uses plus functional values for insulation of electrical devices and corrosion resistance for process equipment.

Combinations of aluminum with other materials, particularly in panels, have potential significance in many fields but first emphasis is evident in architecture and building development.

New High Temperature Alloys Will Pose Forming Problems

J. H. Keeler—In the next several years columbium-base alloys will emerge as new structural materials for service at temperatures well above those which the usual superalloys can withstand. Such alloys are not easily shaped at room temperature; their outstanding strength at elevated temperature makes the usual hot working processes difficult. Since they react with air at high temperature, they require careful heating or cladding techniques.

There will be continued growth of extrusion as a primary breakdown or a powder handling technique. It will result from the expanded uses of reactive and refractory metals whose refining processes usually yield a powder product, as well as from direct reduction processes in the basic metals.

Shock methods of metal forming will continue to spread as engineers and metallurgists become familiar with the techniques.

The increasing trend toward continuous casting of relatively thin sections will be notable. The continuous casting of wide aluminum plates and strip will be extended.

Missile Methods Benefit Commercial Alloy Users

W. B. Pierce—This may be a record production year for stainless. On the commercial front, it will continue to gain in its major markets. We also look for a good level of business in silicon, electrical, and tool steels.

Vacuum melting of intermediate temperature grades and even of low alloys, to attain special cleanliness, came into its own during 1959 and should continue to gain next year. So the already rapid expansion of consumable electrode vacuum remelting will be accelerated.

Improved techniques for rolling wide sheets of stainless and other high alloys to extremely thin gages and close tolerances are making the metals more useful in aircraft and missile design. Special grades of tool steels also are coming into new prominence as construction materials for missiles and bearing materials.

An interesting development: Improved processing and more precise quality control—necessities for high-performance in advanced technologies—have resulted in added quality for the "bread and butter" lines.

New Magnesium Alloys Have Improved Physicals

Robert S. Busk—Cold chamber diecasting with automatically metered feed of molten metal dominates the magnesium process picture. Production installations are expected to increase in the coming year.

New magnesium materials recently made available to industry include a cold bending sheet produced from coil stock. Critical bends can easily be formed cold, eliminating the need for heated dies in many cases.

QE22A, developed in Britain, is a sand and permanent mold casting alloy equal to

Materials and Metallurgy

RALPH L. WILSON
Director of Metallurgy
Timken Roller Bearing Co.
Canton, Ohio

KEMPTON H. ROLL
Executive Secretary
Metal Powder Industries Federation
New York

MARTIN N. ORNITZ
Vice President & General Manager
National Alloy Div., Blaw-Knox Co.
Pittsburgh

the high strength aluminum alloys in mechanical properties but doesn't weigh as much. EK31XA, a U. S. alloy, offers an excellent combination of room and elevated temperature properties. It is also a forging alloy with good properties up to 500° F.

HM11XA, a member of the magnesium-thorium group, is a new diecasting alloy for elevated temperature applications. It retains adequate mechanical properties at about 500° F.

Improved fasteners for magnesium are on the market. Made of high purity aluminum alloy, they eliminate galvanic corrosion around rivets in elevated temperature missile and aircraft applications utilizing magnesium-thorium sheets, as well as in commercial room-temperature products.

Vacuum Melting Grows, Reduces Alloy Impurities

Ralph L. Wilson—The consumable electrode vacuum melting process is destined to find increasing use in the production of the finest quality steels for special applications, particularly for large components. Ingots up to 30 in. in diameter weighing 10 tons or more are being cast.

In the low alloy steels, greater freedom from Magnaflux indications and harmful nonmetallic inclusions justified their specification for aircraft gears, antifriction bearings, and highly stressed parts.

Alloys for aircraft and turbine applications have accounted for the principal demand for vacuum melted steels, but promising new markets are developing. Some current developments are:

1. Alloys such as M-308 and Incoloy 901 are being double vacuum melted. Final melting has no contact with refractories, and the pattern of solidification is controllable.

2. There is a growing need for consumable vacuum melted austenitic stainless steels of the AISI 300 series made to special quality requirements.

3. The standard AISI 52100, a popular steel for ball bearings, was first vacuum melted by the induction melting process. The analysis can be supplied with uniformly excellent quality at lower price by consumable electrode melting.

4. Consumable electrode vacuum melting of the regular engineering alloy steels such as SAE 4340 and 300M has resulted in remarkable improvement in the transverse ductility of these steels at tensile strength levels in the range of 250,000 to 300,000 psi ultimate.

Powder Metallurgy Parts Break Size Barrier

Kempton H. Roll—In powder metallurgy there are three significant trends:

1. Larger parts, measured in terms of pounds rather than ounces, are making definite inroads into the field held by small gray iron castings.

2. New alloy combinations, preblended mixtures of powders, and multiple action presses give improved properties and broader design ranges.

3. It's recognized that lower part cost is not the only virtue of the process. Many users of powder parts have found that controllable density and its corollary, controllable porosity, often result in advantages that compensate for a higher part cost.

Shorter production leadtime and availability of raw materials—a factor highlighted by the steel strike—have led many to use powder parts.

Powder metallurgy is finding acceptance in new areas of application. Although the automotive industry is still one of the principal outlets for powder parts, the industry's dependence on it is being lessened. Important new markets include home appliances, business machines, home workshop tools, household hardware items, garden and sports equipment.

Techniques such as infiltration are finding more widespread use. Infiltration—surrounding a porous steel skeleton with molten copper or copper-base alloy—results in a tough metal part which is fully dense, heat treatable, and platable.

Parts in the range of 80,000 psi tensile can be made via conventional processing—15,000 psi was previously accepted as the working limit. The advance has been made possible by the use of copper and carbon additions to iron.

Other techniques have promise of commercial feasibility during the next two or three years. One is roll-compacting of powder directly into strip or sheets. Continuous compacting systems and hot pressing methods are also being developed. A system that holds much promise: Pressing and sintering granular aluminum powder.

Temperatures, Pressures Tax Alloy Capabilities

Martin N. Ornitz—Increasing improvements and the demands of metalworking industries have continued to put emphasis on the use of high temperature alloys.

Operating processes are rapidly approaching or exceeding present limitations on alloys. Recent developments in blast furnace operations require higher wind temperatures. Replacement of iron blowpipes with alloy helped, but demands for even higher temperatures will require improvements in materials and methods. Higher carburizing temperatures as well as brazing and stainless heat treating are bringing these furnace operations to the range of 2000° F and higher.

We need materials capable of operating at temperatures in excess of 2300° F which have the strength for load carrying capacities and high temperature stability to permit long service.

The use of high temperatures under pressure has changed the type of materials used for piping and other components in refinery, utility, and atomic energy systems. Pressure applications previously considered unfeasible will be made practicable by centrifugally cast pressure tubing utilizing the newer high temperature alloys.

Recent developments in the use of ce-

ramic molds should lead to precision castings of high temperature alloys with extremely thin walls for aircraft, missile, and other specialty applications.

Vacuum Induction Melting Broadens Alloy Markets

J. M. Stevenson—Vacuum induction melting is coming into its own as a production melting process. More is being learned about the aging reactions occurring in nickel and cobalt base alloys and the effects of trace elements. The users of vacuum melted alloys are demanding increased property levels and the added reliability needed for their applications.

The market for vacuum induction melted products has grown considerably in the last few years. In 1956 the only sizable market was centerless ground bar stock for jet engine turbine buckets. The materials are now used extensively in other hot engine parts. The market for high temperature sheet products used in missiles and high speed manned vehicles is developing rapidly.

Many new methods and processes will be seen in the industry as we all try to reduce costs and selling prices. The present practice of converting the ingot into mill shapes is slow and costly since the high temperature alloys have high hot strength and resist deformation.

Engineering efforts will be made to cast the molten metal closer to the final mill shape or product to eliminate the bulk of conversion costs. But the structure control of the casting is important, even though it is subjected to subsequent forging. The final product must have the strength and integrity of conventionally wrought products.

Greater activities are forecast for vacuum induction melted specialty steels in 1960. Increased cleanliness, fatigue life, ductility, and strength add up to greater reliability for critical applications.

Harder Alloy Steels Meet Space Age Needs

John C. Hamaker Jr.—Developments in the fabrication of solid propellent rocket cases have pointed the way to superstrong pressure vessels made of ultra-high-strength steels. Threaded fasteners and major airframe parts of 260,000 and 300,000 psi tensile strength have been used without service failure in production aircraft for several years, but crack propagation, notch tensile, and bulge test studies instigated by early pressure vessel test failures had suggested that all materials become too notch sensitive for the application at yield strength levels above 200,000 to 220,000 psi.

Now full scale rocket cases have been produced to the 240,000 psi minimum uniaxial yield strength level. They have been tested repeatedly without failure or dimensional change. Prototype cases have achieved burst pressures of 250,000 to 340,000 psi. The cases required consumable vacuum melted material, roll ring forgings combined with Flo-turning or similar fabrication to make continuous cylinders without longitudinal welds, improved design, and carefully controlled manufacturing and inspection procedures.

Designers are looking forward to still higher strength materials for lighter designs. Experimental steels with capabilities of 270,000 psi yield and 330,000 psi ultimate are being tested. Materials capable of more than 300,000 psi yield strength via heat treatment are in the laboratory stage. Where limitations on fabrication can be met, the warm working of austenite offers strength improvements. However, materials continue to increase in notch sensitivity as these increases are made. So, the next plateau in the structural application of ultra-high-strength materials will be reached when limitations in design, manufacturing, and inspection again set a barrier on the notch sensitivity that can be permitted.

Demands for improved bearing materials at room and elevated temperatures will also be increasing in the next few years. Several new approaches to bearing compositions are under test, and the advantages of new vacuum melting techniques are becoming evident as production experience is gained. Vacuum melting has also opened a new spectrum of potential tool and die steels using elements heretofore unavailable in air melted materials. The next few years will see increasing quantities of these experimental steels introduced for field testing.

Stainless Steel Figures Big In Future of Nuclear Power

Carl B. Post—The metalworking industry, spurred hard to keep manufacturing costs to a minimum, will use a great deal more stainless steel in 1960 where it is less expensive than other metals, including those that are plated. Added benefits of stainless: Uniform fabrication characteristics and mechanical properties, reliable corrosion resistance, and a long lasting attractive finish.

Stainless has become extremely important to the future of nuclear power. Again, economy is the motivating factor since the nuclear powerplant of tomorrow must be built of the least expensive materials to justify its existence. Modified stainless steels might be considered as replacement for the exotic and much more expensive materials such as titanium, zirconium, columbium, and molybdenum.

Boron enriched stainless steel (Type 304 with up to 2.1 per cent boron) has been supplied for control elements in nuclear power installations. At high boron levels, mechanical properties, particularly toughness and ductility, are low. A recently introduced control rod stainless contains special isotope of boron, B^{10}, which is about 10 times as effective for control as natural boron and overcomes the objectionable low ductility.

Most metalworking plants will buy stainless in cold finished forms to much closer dimensional tolerances than are now specified. For even greater cost savings

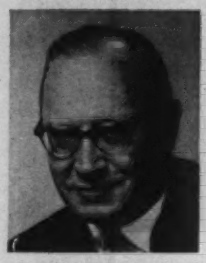
Materials and Metallurgy

J. M. STEVENSON
Specialty Alloys Section Manager
Metallurgical Products Dept.
General Electric Co.
Detroit

JOHN C. HAMAKER JR.
Director of Research
Vanadium-Alloys Steel Co.
Latrobe, Pa.

CARL B. POST
Vice President & Technical Director
Carpenter Steel Co.
Reading, Pa.

Materials and Metallurgy



T. F. OLT
Vice President
Armco Steel Corp.
Middletown, Ohio

THOMAS W. GABRIEL
Vice President, Commercial
Jessop Steel Co.
Washington, Pa.

R. E. PARET
Executive Secretary
Committee of Stainless Steel Producers
New York

and more uniform quality, the plants will purchase the hardenable grades, particularly free machining Type 416 stainless, fully heat treated to the mechanical properties they require.

Users can expect improved performance and reliability from tools and dies during the next two to three years. Changes in design, fabrication, and heat treatment will cause significant improvements. But steel producers will also make contributions to lower costs. Bars will be more uniform in structure than those now available. In addition, most users will buy bars free from decarburization, cold finished by the producer to closer dimensional tolerances.

Continued improvement is expected in the permeability of magnetic alloys which are vitally important in the miniaturization and development of electronic equipment.

Ultrathin Stainless Sheets Hold Down Aircraft Weight

T. F. Olt—New designs for Mach 3 aircraft like the B-70 Valkyrie make free use of honeycomb panels in the airframes. Thin, high strength, stainless steel skin sheets are backed up with still thinner foil honeycomb. Overweight penalties have made cold rolling thickness control mandatory. An extra 1 thousandth of an inch thickness in the sheet metal elements alone would add about a ton to the weight of the B-70. Advances in continuous gaging on cold strip mills are being made to reduce thickness variation (including crown) of sheets and strip to one-fourth of standard AISI tolerances.

Further savings in weight are being realized in making aircraft components. Chemical milling is being used for tapering the steel skin sheets and for selectively removing metal that does not contribute to design strength.

Among significant developments in the fabrication of Armco PH 15-7 Mo aircraft parts is the Cryoforming process. The slight growth accompanying the austenite to martensite phase transformation is put to work to get accurately patterned and dimensioned high strength parts. Warm sheet metal parts are restrained in warm conforming dies during the low temperature phase transformation.

Other new methods that will be used to work precipitation hardening stainless steels in the years to come include explosive forming and roll turning. The techniques will be especially useful in the area of large missile casings where precipitation hardening at low temperatures offers practical advantages.

One of the technological improvements being sought in the precipitation hardening stainless steels, as with other high strength materials, is improved toughness at high strength levels when the material is stressed biaxially.

Higher Physical Requirements To Boost Alloy Quality

Thomas W. Gabriel—During the next five years, the problem of improved quality and higher physical properties will be aggravated by the growing programs of the Space Age and the Atomic Age. The competition of little known materials and metals will add pressures to the steel industry.

We have arc melted boron stainless steels with up to 1.25 per cent boron. Higher boron contents have been made from induction heats. The material is used for atomic reactor shielding. We have also been active in zirconium alloy conversion for Naval reactors.

The missile production program illustrates the need for much greater controls in rolling, heating, and finishing. Improved practices have contributed, but production contract specifications will become more rigid, and equipment changes will become mandatory. Because of severe decarburization limits, atmosphere or other controls of heating and annealing will be necessary.

The importance of surface and tighter dimensional tolerances present production difficulties, especially because many widths are greater than normal for present precision rolling equipment. In finishing, the flatness needs for final fabrication may call for improved equipment.

The high transverse physical properties being specified in many fields have resulted in many experimental vacuum melting installations.

New Markets Challenge Stainless Technology

R. E. Paret—Aircraft, missile, and space vehicle builders have a standing order for better structural grades of stainless to handle ever higher skin temperatures. Airframe producers are welcoming the new austenitic stainless alloys which combine heat resistance with high-strength-to-weight ratios.

Demands of nuclear plant designers have brought at least two new stainless developments. Austenitic Type 304L stainless steel now can be supplied with cobalt content controlled to an acceptably low level, relieving nuclear repair personnel from the dangers of cobalt 60. Boronated stainless alloys are reported to provide high thermal neutron absorption, corrosion resistance, and good structural stability at 500° F under irradiation. From one reactor builder comes the news that irradiation increases yield strength in at least some stainless steels. The work hardening rate is decreased by irradiation, the same source notes, a phenomenon which may open the way to stainless alloys predictably variable in work hardenability.

Fabricators look to new techniques to lower costs. Stainless extrusion, for example, offers great freedom of section design and the possibility of integral, complex shapes. Tubular shapes with dissimilar internal and external contours can be extruded with ease.

Roll formers now turn out standard stainless shapes at relatively low cost, in sections previously thought suitable only for mass production. Combinations of different, standard dies permit roll formers to spread die costs over many jobs. Fabri-

Materials and Metallurgy

T. S. FITCH
President
Washington Steel Corp.
Washington, Pa.

N. W. BASS
Vice President
Brush Beryllium Co.
Cleveland

KENNETH D. MANN
President
Firth Sterling, Inc.
Pittsburgh

J. H. JACKSON
Manager, Dept. of Metallurgy
Battelle Memorial Institute
Columbus, Ohio

cators have strong hopes that roll forming is the answer to low cost production of architectural shapes.

Watch Colored Stainless In Architecture This Year

T. S. Fitch—We believe that the greatest advance in the stainless market this year will be in the use of colored metal—particularly in architecture, the alloy's largest new potential market.

Although stainless is difficult to color in its natural state, it can be coated with modern finishes that adhere well and are long lasting. The coating compounds are pigmented to make any color required. A special acrylic compound cures at 350° F and adheres well to any stainless finish.

The precoated stainless in sheet form can be pressed into panels, brake formed into mullions or spandrels, and roll-formed into window sections. It will undergo severe forming operations without spalling, cracking, or loss of adherence to the metal.

Almost as important as the lower initial cost is the fact that the coating system permits easy and fast field repair.

Stainless in color, as a new vehicle in the achitect's portfolio, will start coming into its own in 1960.

Beryllium Structural Uses Studied for Space Designs

N. W. Bass—Fabricated beryllium (produced by a powder, vacuum, hot pressing process) has been accepted as a structural material for aircraft and missile design, as well as in nuclear and instrumentation applications.

One result: Commercial production of such things as missile re-entry body structures and other system components. The material is also being investigated for use in hypersonic craft, brake assemblies, and airfoil leading edges. Nuclear applications include the accepted moderator and reflector uses, and intensive work going on in England and U. S. is aimed at producing thin walled tubing suitable as fuel element jackets for gas cooled, atomic power reactors.

Considerable progress is being made on the joining of beryllium, as well as production of honeycomb and composite structures. This area of fabrication is expected to increase dramatically over the next few years.

Utilization of beryllium as a structural material is expanding rapidly. Technological problems concern the adaption of conventional fabrication techniques.

Forging of Molybdenum Is Fairly Commonplace

Kenneth D. Mann—The progress in engineering new missiles, aircraft, and spacecraft has resulted in an accelerated program to provide more refractory type materials. At the same time, requirements for improved properties have increased the rate of development of new alloys as well as processes such as consumable arc melting, the Hopkins Process, and vacuum induction melting.

A development in the field of highly refractory metals that's progressing rapidly: Forgeable tungsten billets and preforms made by powder metallurgical methods. The forging of molybdenum components has become relatively commonplace. Rapid progress is being made on the tungsten-tantalum series and many others.

Another achievement: The pressing, sintering, and machining or grinding of complex and highly accurate components of tungsten and other refractory compounds such as borides and carbides—including carbides with melting points higher than that of tungsten. The problems of machining and otherwise finishing the materials have been accentuated even though considerable progress has been made. Much more effort is needed on conventional methods and processes, such as electrochemical machining and Electrospark machining.

Another area requiring investigation: The design of equipment to produce large things, such as 1-ton billets, wide sheets, large pressed and sintered nozzles.

New Ways to Work Metals To Hold Spotlight in '60

J. H. Jackson—A new induction melting method uses a segmented metal crucible that is water cooled and is not wet by the molten metal. It eliminates contamination by crucible refractories and can be adapted to continuous casting.

Problems of a brittle layer of iron-aluminum alloy in steel reinforced aluminum wire have been solved by a powder metallurgy process. The method also removes limitations on the thickness of the aluminum coating.

Warm working—above room temperature but below hot working ranges—has lifted tensile strengths from 100,000 to 135,000 psi with little loss in ductility. Another process, technically described as the working of metastable austenite, is being developed and holds promise of greatly increased yield strengths with little sacrifice in ductility. Tensile strengths over 400,000 psi have been produced, with a 90 per cent reduction in cross section.

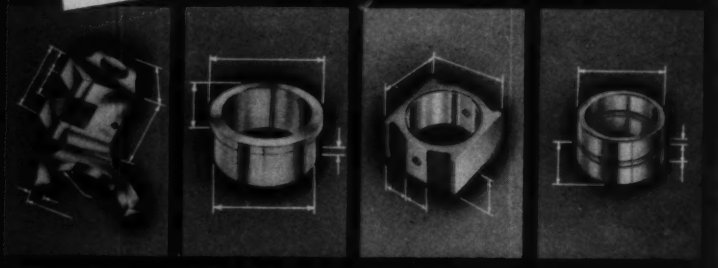
Another active field is high energy rate forming. Explosive forming and Dynapak are examples. Certain types of forming, not possible at ordinary speeds, have been successful. Ultra-high-speed machin-

BUNTING® BEARINGS

engineering for **both** cost and mechanical requirements in the bearing field . . .

Bunting can help you identify and procure the bearing or part that will do your job at the lowest possible cost. Often a re-examination of the actual mechanical needs of a bearing application reveals an opportunity to save money in design. Another saving is almost invariably achieved by considering ALL the new bearing materials which Bunting makes available to you today. Let Bunting help you engineer your bearing application in the light of modern availabilities. Send in your blueprints or ask for engineering counsel.

. . . case in point *



*Clearly evident is the economy in the production of this shifter fork by Bunting Powder Metallurgy. The elimination of practically all machine work effects striking cost reduction.

*This cylinder gland bearing made of Bunting Bearing Aluminum is an example of how to save weight and money on the cost of large, thick-wall bearings and parts.

*This cast bronze cam block, made to unusually close limits with very fine finish, is absolutely round and true to size with cost at a feasible figure.

*Solid cast aluminum gear bearing to replace roller bearing for longer life and lower cost.

BUNTING ENGINEERS . . . Bunting maintains a staff of bearing engineers whose wide experience and specialized knowledge are available to you gratis for study and recommendation concerning your current or contemplated bearing applications.

write for these . . .

No. 158 General Catalog—Complete listings of Cast Bronze and Sintered Bronze Stock Bearings and Bars and Bunting Bearing Aluminum Bars. Pocket size edition.

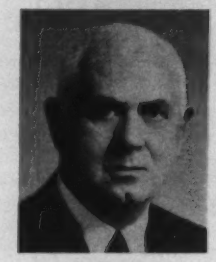
No. 1 Engineering Handbook of Powder Metallurgy—A comprehensive technical treatment of engineering and manufacturing of sintered metals, bearings and parts.

No. 46 Technology of Bunting Bearing Aluminum—A technical treatise on the composition of and machining Bunting Bearing Aluminum Bar Stock.

The BUNTING Brass and Bronze Company
Toledo 1, Ohio, Phone EVergreen 2-3451

BEARINGS, BUSHINGS, BARS & SPECIAL PARTS OF CAST BRONZE SINTERED METALS OR ALUMINUM ALLOYS

Materials and Metallurgy



F. L. LaQUE
Vice President
International Nickel Co. Inc.
New York

ing is being investigated, to learn more about the machining process.

Other interesting developments include: Making large flat sheets without conventional rolling; fabrication of large rocket cases by a variant of deep drawing; new aluminum-silicon casting alloys which may eliminate cylinder liners; "lead cemented" alloys of high corrosion resistance; new methods of making metal fibers; and the development of foamed metals.

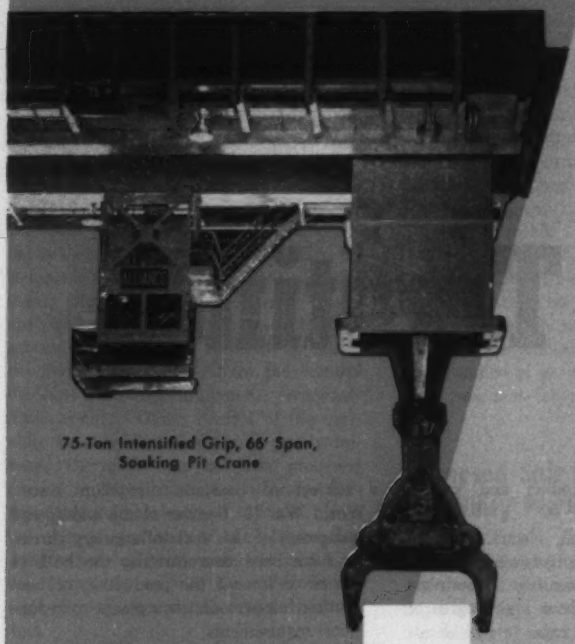
Nickel Alloys Lend Themselves To the Newer Processes

F. L. LaQue—Nickel-base materials are coming into even more extensive use for critical applications requiring exceptional properties. Some of the newer processes being applied to nickel base alloys are:

Power spinning for cold forming; forming, cutting, and welding by the use of controlled explosive forces. (Tooling can be relatively simple and economical.); rotary forging, either hot or cold, with interesting savings in tools and improved control of finished shapes; new methods for metal removal, as by electromachining, electrolytic milling, chemical milling, electron beam machining, and ultrasonic machining; electron beam welding, avoiding of contamination from the atmosphere, electrode or other sources; plasma jet heating, for high melting point metals and coatings.

In the area of alloy production, there remains a need for a cheaper way of securing advantages now achieved by vacuum melting. New ways are wanted for control of the elements encountered, sometimes in trace amounts, that can have profound effects on the properties of metals. Such new methods must be applicable on a high tonnage base for the manufacture of both ferrous and nonferrous alloys.

There's More in a CRANE Than BASIC MATERIAL



75-Ton Intensified Grip, 66' Span, Soaking Pit Crane

The soul of a crane is the creative thinking of ALLIANCE "Imagineering". Ruggedness, service and dependability are the unseen qualities of all ALLIANCE equipment. Equipment that has brought industry to . . .

LOOK TO ALLIANCE FOR LEADERSHIP.

ALLIANCE FOR GREATER OVERALL RETURN FOR YOUR INVESTMENT

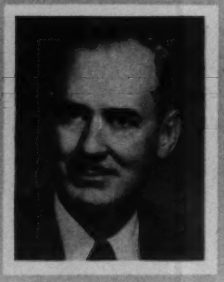
Give us the Runway...

and We'll Lift the World.

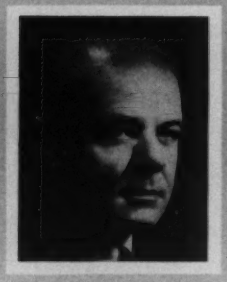
the Alliance machine company

Main Office Alliance, Ohio

Overhead Cranes * Gantry Cranes * Mill Cranes and Equipment * Hot Metal Cranes * Ladle Cranes * Stripper Cranes * Soaking Pit Cranes * Soaking Pit Cover Cranes * Charging Machines * Furnace Chargers * Slab Handling Cranes * Bucket Cranes * Magnet Cranes * Mold Yard Cranes * Skull Cracker Cranes * Ingot Buggies * Run-Out Tables * Car Dumpers * Special Mill Equipment * Ore & Coal Bridges * Loading & Unloading Towers Forging Manipulators * Forging Cranes * Power House & Dam Cranes * Dock & Pier Handling Equipment * Research, Development & Engineering Service * Licensees & Manufacturing Facilities in Other Countries



ELTON E. STAPLES
Vice President
Hevi-Duty Electric Co., div.
Basic Products Corp.
Milwaukee

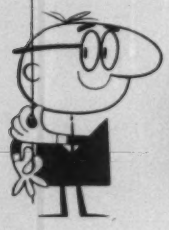


ROBERT B. HANNA
General Manager
Industrial Heating Dept.
General Electric Co.
Shelbyville, Ind.

VINCENT R. TROGLIONE
Vice President & General Manager
Sunbeam Equipment Corp.
Meadville, Pa.

C. R. WEIR
President
Metal Treating Institute
Commonwealth Industries Inc.
Detroit

1960 FORUM ON TECHNICAL PROGRESS



Heat Treating

Higher Temperatures, Closer Control Seen for Furnaces

Elton E. Staples—Two developments will have increasing impact on industry in the coming year. The first is the miniaturization of electronic control through wider adaptation of transistors. The second is the production of new, smaller automobiles and the use of aluminum engines.

High temperature furnaces in the 5000° F range are no longer a novelty. Aluminum melting and heat treating furnaces in larger units and for automated handling are in production. Automatic machines that cast aluminum slugs for impact extrusion and preforms for forging are available.

Computers, Controls To Aid Heat Treating Technology

Robert B. Hanna—This year the industrial heating industry will refine high temperature, high vacuum, and high purity atmosphere techniques and develop better methods of heat transfer to accelerate the heating and cooling of a wide variety of products. The goals are a more uniform product and smaller equipment.

A muffleless, vertical, electric furnace, utilizing high purity hydrogen for the continuous bright annealing of stainless steel strip, will provide a high degree of uniformity. In many cases it will eliminate the need for pickling and polishing.

New equipment for producing high purity hydrogen and nitrogen from natural gas will also be available. It will be practical in the smaller sizes.

The electrical and nonferrous industries will find vastly improved ovens and auxiliary equipment available for the application and baking of insulating enamels on copper and aluminum wires.

Automatic material handling to and from furnaces is expected to expand considerably. Much work is being done with the installation of automatic data recording and processing equipment on large, continuous, steel strip annealing furnaces.

Automation Will Improve Heat Treating Quality

Vincent R. Troglione—Our most challenging problem today is not a new one. The ever mounting cost of labor has been a subject of constant discussion since World War II. Because of the widespread realization of this real inflationary threat, we have been concentrating the bulk of our effort toward the production of heat treating furnaces and equipment to reduce labor requirements.

Our plans for 1960 call for greatly increased effort in this direction. Customers insist on equipment designed to do everything automatically with only the minimum of labor. Obviously, this presents a great opportunity and a challenge.

The quality of the final product is also becoming increasingly important. The new materials used today offer tremendous potential, but realization of the potential demands equipment giving closer control in every respect of heat treating. Now equipment and designs will reflect the more stringent requirements.

Heat Treating More Advanced Than Processing Materials

C. R. Weir—Last year saw the introduction of several gantry type vertical furnaces for the processing of rocket motor bodies. Seven are in the hands of commercial heat treaters. Their use may be extended to other fields, such as the heat

FREDERIC O. HESS
President
Selas Corp. of America
Dresher, Pa.

A. F. HOLDEN
President
A. F. Holden Co.
Detroit

C. H. STEVENSON
Vice President
Lindberg Engineering Co.
Chicago

JOHN A. LOGAN
President
Ajax-Magnethermic Corp.
Youngstown

treating of bars, structural shapes, rails, and slides.

Developments in the higher strength, high temperature alloys and corrosion resistant refractories will increase component life and allow less heavy design.

The heat treating industry is on the threshold of considerable expansion of capacity—most of it will be highly instrumented automatic equipment. Equipment, atmospheres, and control devices are well ahead of the materials they process. A variation such as chemistry or grain size rather than the control of heat treating equipment frequently limits results. Closer control of the variables by manufacturers would greatly improve the uniformity of heat processed parts. It is of little use to have furnaces controllable within ±5° F (often less than 1 per cent of actual temperature) when alloying materials and carbon frequently are not controlled within 7 or 8 per cent in the same heat of steel.

Automated Heating Pushes Material Handling Study

Frederic O. Hess—The trend toward greater automation in heat treating should continue well into the future. Despite outdated U. S. tax depreciation policies which discourage equipment modernization, manufacturers have no alternative but to strive for more and more mechanization in their heat processing operations.

They must automate heat processing to cut costs, but more than that, they have found that automatic equipment can tolerate variations in only limited proportions—which means that the human element must be minimized.

This places the furnace builder in the material handling and instrumentation business, since the resulting equipment may constitute 95 per cent handling and instrumentation, 5 per cent heating.

The many problems, while difficult, are not insurmountable. Obviously, they cannot be overcome with "standard" or "conventional" furnaces. The only alternative is to engineer and custom-build furnace equipment, which often stimulates a fresh approach.

The pressures of greater operating efficiency, more complex material requirements, and the "inspection" characteristics of high speed automatic equipment leave no place for conservatism—nor does the performance of growing competition from European and other countries.

Increased Salt Bath Flexibility Predicted

A. F. Holden—During the next three years, salt baths will take on increasing importance in most areas of metalworking through applications to automated production lines and improved design.

A system for desludging from a conveyor or fixed location has been designed for the descaling of strip or wire and wire patenting in the steel industry.

The latest designs in salt bath equipment, calling for straight-line operation, have many likely uses in industry because of their easy adaptability to automation systems, high selectivity, and positioning from a control center.

Another area of increasing application has been found with the instantaneous heat—or luminous wall furnace—combustion system. Rocket engine cases are put through the high heat phase in a cylindrical luminous wall furnace, dropped immediately into a salt bath quench, then transferred to a salt bath tempering furnace. In effect, it is a straight-in-line, automated operation.

In 1960, we look for the streamlining of equipment for steel mill operations.

Salt bath design planning through 1961 and 1962, we feel, will be aimed at further flexibility.

Zone Purification May Graduate from Lab

C. H. Stevenson—Physical properties which were entirely unknown a few years ago are obtainable today. The new strengths come from new alloys and new treatments. New alloys in the missile field are commonly used in rocket cases. They require special equipment and accurate atmosphere control to preserve their surprising qualities.

Zone purification of ordinary metals by laboratory methods, resulting in 1 part of impurity in 1 billion parts, has opened up a new vista. The method may move into the tonnage field some time soon.

Melting, pouring, and heat treating in vacuum are helping to approach the ultimates.

As is always true in progress of this kind, the materials are expensive at first. A sign on the bulletin board of a large plant says: "If it's 99 99 per cent pure, it's worth $5 per pound. If it's 99.9999 per cent pure, it's worth $500 per pound."

The problem, as always, is to reproduce this laboratory production of pounds into plant production of tons.

Induction to Claim Larger Share of Heating Market

John A. Logan—Induction heating continues to assume a larger portion of the industrial heating market. Increasing use can be attributed to industry recognition that processing costs are affected by much more than initial equipment costs and fuel costs.

Our industry is growing in many directions. A few years ago a few hundred kilowatts and a 100 lb load were considered large; today, induction heaters and furnaces with ratings of several thousand kilowatts are under construction or in operation. Heating loads like 13,000 lb steel billets to forging temperature, melt-

Heat Treating

F. T. COPE
Vice President, Sales
Electric Furnace Co.
Salem, Ohio

ROBERT E. FLEMING
Executive Vice President
Industrial Heating Equipment Assn.
Washington

IRVING A. DICKTER
Chief Metallurgist
Meta-Dynamics Div.
Cincinnati Milling & Grinding Machines
Cincinnati

ing or holding 30,000 lb charges of nonferrous metal, or 14,000 lb charges of ferrous metal indicate a definite trend toward larger induction units in mass metal processing.

The recent application of high efficiency, static frequency multipliers is changing the complexion of induction heating in a number of areas. The devices are being applied to metal heat treating and hot working operations.

In heating for hot working, we see improved structures, surface conditions, and physical properties when induction heating is properly applied. In melting, closer control of analysis improves quality, and in heat treating, we look for better structures or combinations of structures, with beneficial residual stresses.

The technological problems of the induction heating industry are being tackled by continual research and development in the laboratory and in the field.

Needed: Conveyor Materials For 2000 to 3000° F Service

F. T. Cope—The use of vacuum to replace conventional furnace atmospheres in heat treating is growing. Although, in most cases, vacuum pumping equipment and vacuum furnace design require a moderately higher original investment than special atmosphere furnaces and generating equipment, many compensating factors favor the more expensive arrangement.

In the annealing of continuous strip, for example, savings in operating costs make it possible to amortize the vacuum furnace in less than 12 months.

Vacuum annealing provides several other tangible and intangible benefits, such as outgassing of the refractory metals, elimination of explosion hazards, and elimination of atmospheric nitrogen pickup which affects the physical properties of foil and light gage strip.

Another important development is the production of strip, bars, and other shapes, directly from metal powder, eliminating operations such as rolling or drawing from the ingot or billet stage. The practicability of this process for such metals as steel, stainless steel, copper, nickel, and aluminum has been convincingly demonstrated, and pilot plants are in operation.

Foreign competition is a problem confronting the heat treating and metalworking industry which will get worse before it gets better. We have lived in an ivory tower of American design superiority for many years, but foreign designers are rapidly overtaking us, and with their lower production costs, they are becoming a serious threat in our own backyards. We can meet the threat only by engineering equipment which is more efficient, or more reliable, or both.

The most pressing breakthrough required by the heat treating industry is the development of materials, either metallic or refractory, for furnace conveyor systems of usable strength in the 2000 to 3000° F range. Present day requirements have in many cases removed high temperature heat treatment from the batch or semibatch type of operation, and much improved high temperature materials are required to produce a truly reliable production type continuous furnace.

Mechanization Seen as Aid To Quality, Lower Costs

Robert E. Fleming—In 1960, industry will place unprecedented emphasis on cost reduction and quality control in manufacturing operations. The close surveillance of manufacturing cost factors will call for much greater design ingenuity on the part of the industrial heating equipment industry.

There will be an increasing trend toward greater mechanization and expanded use of automatic conveyor systems. In addition to the trend toward more completely automated equipment, larger heating chambers and faster heating cycles will be required. An expansion in the sintering of powdered metal parts can be expected because of the economies inherent in the process.

The steel industry can expect significant progress in the design and operation of equipment for heating heavy sections (such as billets and slabs) with greater uniformity and at faster rates. Better quality of finished products at greater production rates can also be expected in the nonferrous industry.

In industries where volume production of small and medium parts is commonplace, induction heating equipment manufacturers will provide faster, more compact units with greater precision of temperature and quality control. Space requirements will be reduced. In addition, induction equipment builders will provide more completely automated equipment for a wider range of metal products.

With the great attention cost control and quality improvement will receive from industry in 1960, it is inevitable that much obsolete industrial heating equipment will be replaced with modern, efficient, labor saving units.

Flame Hardening Mechanized, Hits Higher Temperatures

Irving A. Dickter—The past year has seen further development and use of the jet and plasma-jet burners. It is quite evident that these sources of high temperature heating are well beyond the laboratory stage for nonmetallic as well as metallic applications. Highly concentrated heat sources are used to spray ceramic and metallic coatings and as a means of melting the highly refractory metals. That has been valuable in the missile and rocket fields in solving the problem of producing metals which would retain their properties at temperatures above 1000° F.

Some of the newer metals must be formed at extremely high temperatures. Flame heating has been used successfully on metal forming equipment. In par-

ticular, the forming of magnesium-thorium alloy sheets has been accomplished with a reported increase in mechanical properties.

The basic building block concept in machine tool design is being employed with increasing frequency in newly built flame heating machines for use, with or without additional auxiliary units, for a wide variety of parts. Machines with newly designed flame heating heads and accompanying quench heads, fully automated, have been produced.

Where quantity production at minimum costs is required, the demand continues for fully automated flame heating equipment specifically designed for high volume production. To meet demands for capacity, designers have been forced to increase the strength of many components without changing their dimensions. To reduce fatigue or other stress failures, some parts (such as thrust faces with adjacent fillets) have been selectively flame hardened. Service life on parts so treated has been greatly increased.

Capital expenditure and floor space requirements for conventional furnace equipment have been great influences in the trend to the use of smaller selective heating equipment of equal productive capacity. Those factors will influence users of heat processing equipment to carefully weigh the advantages of selective heating equipment before a final choice is made.

Jet Age Rockets Use of High Strength Steels

A. L. Jerome—The jet age, with its missiles and rocketry, has focused attention on the use of high strength materials, justifying them from an economic and practical point of view. Their utilization will be greatly accelerated in this and coming years.

The designer favoring composite fabricated structures will be taking advantage of the individual properties in a combination of materials which can be used in an assembly. Manufacturing methods must be available and practical so as to stimulate the adaption of those designs.

Tensile strengths of 300,000 psi and upward with remarkably low brittle transition temperatures and improved fatigue strengths are within realization for the more common alloy steels. There will be a greater trend for steel consumers to purchase steel to desired physical properties for specific size and application.

Much attention has already been given to forming and machining, as well as flame cutting techniques to obtain closer control of shapes and fits. Special tooling and machinery will be needed and could result in complex machining that will combine one or more of those operations. The use of welded structures is becoming increasingly prominent, but much must be learned with respect to welding high strength materials. New weld products and methods will have to be blended and backed up by sound metallurgical testing and understanding. Here, too, automatic and semiautomatic welding methods will be favored in production.

One must evaluate the advantages of welding steel which has been heat treated, or heat treating welded structures. The latter procedure will result in the realignment of heat treat methods; quenching facilities will, in turn, have to be tailored to obtain maximum properties. To do that, more complex fixtures for drastic and possibly differential type quenching will be employed.

Heavy Production Will Use More Precise Heat Treating

J. L. Whitten—In 1959 the development of the opened coil system was rounded out with the completion of two pilot plants—one for sheet coils and the other for tin plate coils. The processing of over 300, full size steel coils in a research unit indicated that the process is a major breakthrough in the steel industry.

It is highly adaptable to all the new special steels that are being developed for enameling, for electrical purposes, and any of the other new products that depend on changing the carbon and nitrogen content of the materials during the annealing process.

Naturally, the opening of this new field of metallurgical control indicates a greatly expanded use of the opened coil system in 1960.

New Salt Bath Designs To Promote Wider Use

Leon B. Rosseau—Application of a new, fuel fired design for salt baths has shown that such furnaces can be used in economic areas where other designs were ruled out. We expect that the direct fuel fired, ceramic pot furnace will lead to wider salt bath applications where intermittent operation is required and in extrusion and forging. Additional design data will be accumulated.

An elevator mechanism has been redesigned for the handling of heavier loads, increasing the size of parts which can be handled automatically through complex heat treatments.

Another design, recently used for the precipitation hardening of beryllium copper strip, has the strip entering and leaving the pool of salt through slots below the salt level. Pumps return salt from a heating sump area.

Continuing work on mechanisms has widened the range of parts which can be handled by automatic lines; previous limits on size and weight have been exceeded. Greater choice in available handling equipment should make further automation in salt bath heat treatment com-

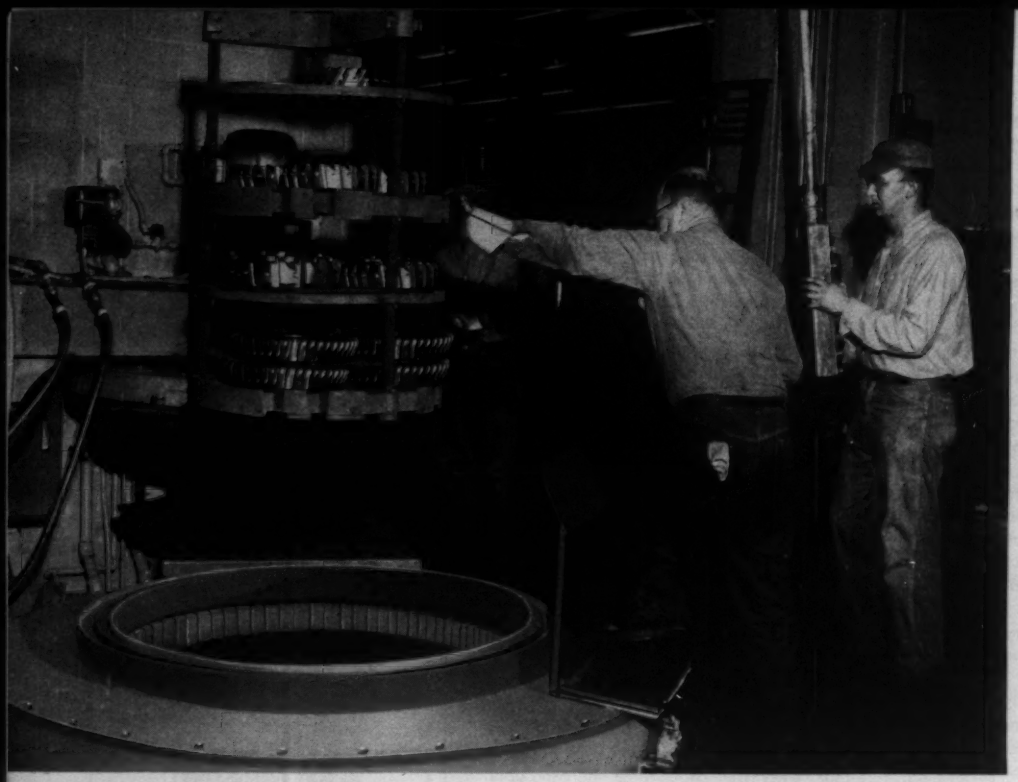
(*Please turn to Page 242*)

Heat Treating

A. L. JEROME
Plant Metallurgist
Caterpillar Tractor Co.
Peoria, Ill.

J. L. WHITTEN
Vice President
Lee Wilson Engineering Co.
Cleveland

LEON B. ROSSEAU
President
Ajax Electric Co.
Philadelphia

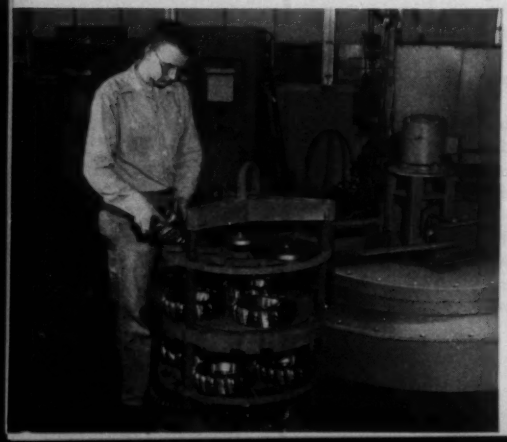


This Lindberg Furnace, Model CT3848-A, is being used at Ingersoll Milling Machine Company, Rockford, Illinois, for hardening Ingersoll inserted blade milling cutter bodies and also for gas carburizing. It is equipped with Lindberg's exclusive CORRTHERM electric heating elements. Temperature range 1850° to 2000°F.

THIS VERSATILE LINDBERG FURNACE BELONGS IN MOST ANY METAL WORKING OPERATION

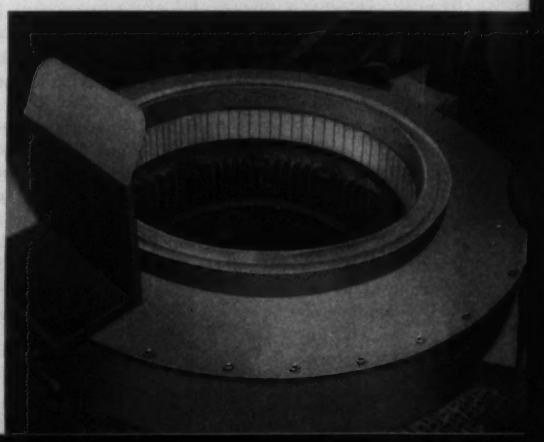
Heat treating installations across the country, captive or commercial, have found the versatility and dependability of this Lindberg furnace, either electric or fuel fired, a great production asset. Used at Ingersoll for hardening and carburizing, it is also ideal for a variety of heat treating needs including normalizing, annealing and tempering. This furnace occupies little floor space, handles a large volume of production and its rugged construction keeps maintenance costs uniformly low. At Ingersoll, it is one of several Lindberg furnaces in regular operation. Others include pit and box type Lindberg Cyclones and an L-type Furnace. Atmospheres are provided by Lindberg Hyen Generators.

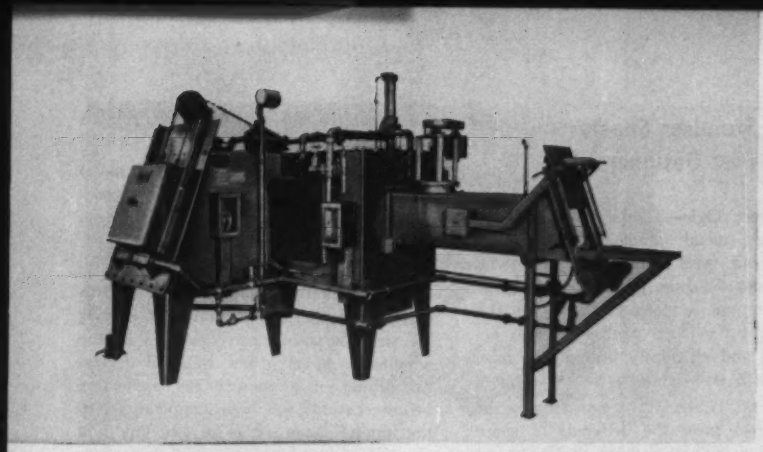
Lindberg has developed a wide variety of equipment for any industrial heat treating requirement. We provide everything from individual furnaces to complete, automated heat treating installations. These can either be factory-built or installed in your own plant. For the most satisfactory answer to any heat treating problem see your local Lindberg field representative (consult your classified phone book) or write direct to Heat Treating Division, Lindberg Engineering Company, 2441 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg, Limited, Toronto.



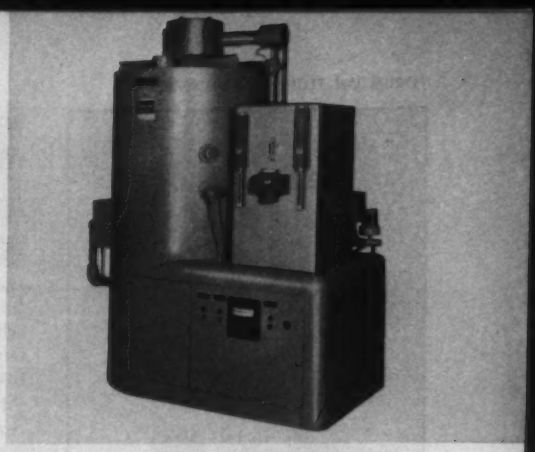
Fixture being loaded with work while furnace is treating another load. Treated load will be removed and new load inserted quickly and easily.

CORRTHERM heating elements operate at extremely low voltage so heat leakage through carbon saturation is eliminated and shock or short hazard prevented. Makes possible use of electricity for carburizing without furnace retort.



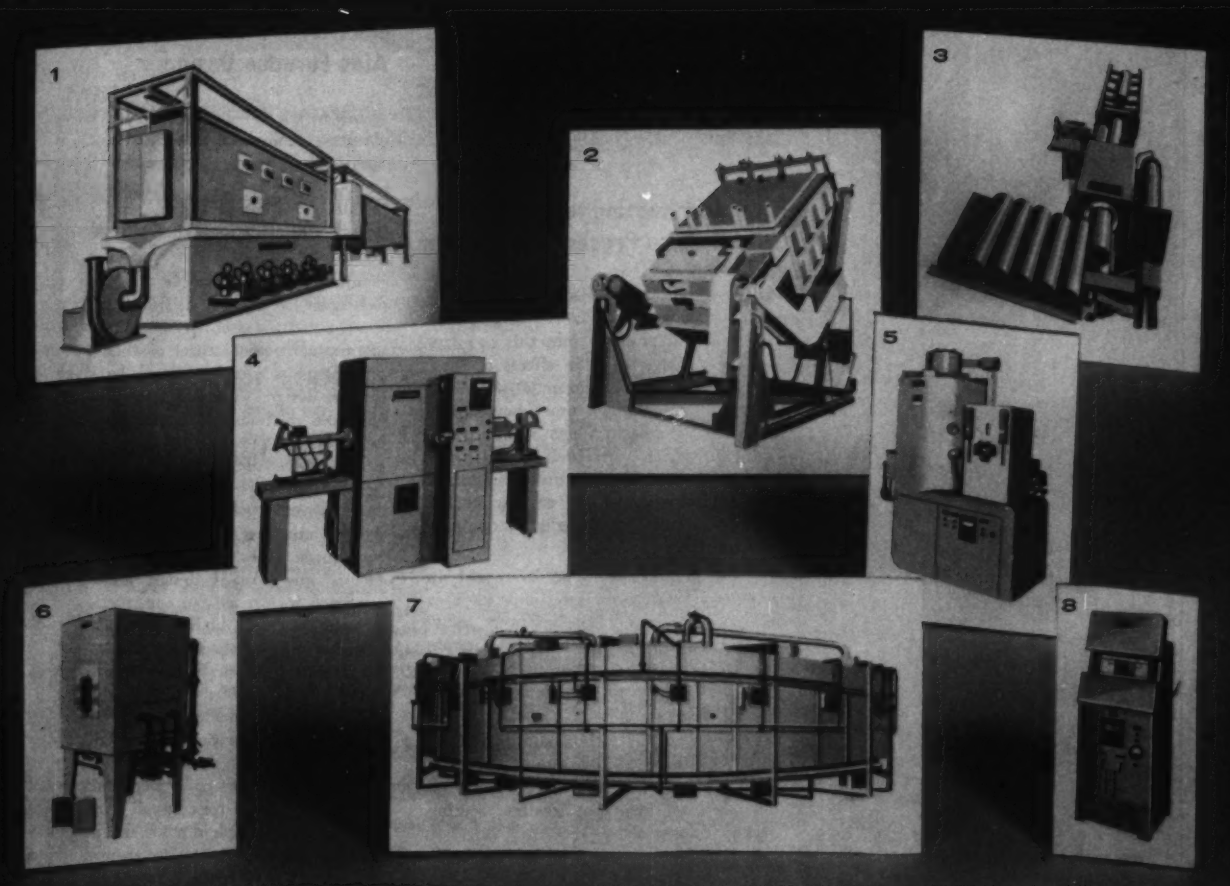


The Lindberg installation at Ingersoll includes one of our L-type Furnaces, ideal for treating high speed steel.



Atmospheres for Lindberg furnaces at Ingersoll are provided by Lindberg's Hyen Generator, a fully automatic process for producing endothermic atmospheres.

THERE'S LINDBERG EQUIPMENT FOR EVERY INDUSTRIAL HEATING NEED



1 Salt Bath Furnaces: Complete line of Lindberg-Upton equipment for all types of salt bath treatment. Shown: Installation for aluminum dip brazing.

2 Melting and Holding Furnaces: Equipment for any non-ferrous metal requirement including electric resistance and induction reverberatories, crucible and two chamber induction units. Shown: 350 KW Induction Furnace with 30,000 lb. capacity.

3 High Frequency Units: Complete range of induction heating units and furniture. Shown: New Induction Billet Heater for aluminum extrusions.

4 Pilot Plant Equipment: Complete group of intermediate sized furnaces for pilot plant and small production application. Shown: New Graphite Tube Furnace, temperature range 2500°F. to 5000°F.

5 Atmosphere Generators: Generators for all required furnace atmospheres. Shown: Hyen Generator for endothermic atmospheres.

6 Ceramic Kilns: All types of kilns: automatic, atmosphere controlled, high temperature, tunnel and periodics. Shown: Periodic Kiln, temperature range to 3250°F.

7 Heat Treating Furnaces: For every requirement, large or small, electric or fuel fired, factory built or field-installed. Shown: Rotary Hearth Furnace field-installed by Lindberg Industrial Division.

8 Laboratory Furnaces: Complete line of laboratory furnaces from simple hot plates to specialized research units. Shown: Versatile, wide temperature range Laboratory Box Furnace.

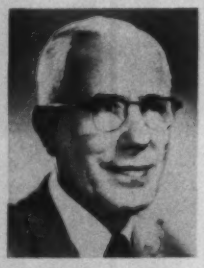
For full information on any type of Lindberg equipment see your local Lindberg field representative (look in your classified phone book) or write to Lindberg Engineering Company, 2441 W. Hubbard Street, Chicago 12, Illinois.

LINDBERG heat for industry

Heat Treating

M. ROBERT OGLE
Sales Manager
Drever Co.
Bethayres, Pa.

H. B. OSBORN JR.
District Manager
Ohio Crankshaft Co.
Cleveland



HENRY M. HEYN
Vice President
Surface Combustion & Janitrol Divs.
Midland-Ross Corp.
Toledo, Ohio

(*Concludel from Page* 239)

mercially practical. It is important to design as much flexibility as possible into new mechanisms.

We expect design developments to continue to widen the field of molten salt baths.

Wider Stainless Sheets Will Assist Designers

M. Robert Ogle—There is a need to modernize metal producing fabrication facilities to meet competition at home and abroad. Lower production costs are of paramount importance and will be achieved by modern equipment that effectively and efficiently utilizes our relatively high cost labor.

New metals and alloys are going to be required to meet the demands of space exploration and increasing utilization of atomic energy. Methods will need to be developed to utilize present metals in different forms. Wide, light gage, stainless steel flat products and heat treated grades of carbon steel in plate and structural forms will allow the design engineer to decrease weight with no sacrifice in strength.

The furnace industry will be called upon to develop facilities in co-operation with producers and fabricators to meet the challenge of producing metal products more efficiently and with less waste.

Induction Heating to Help Straight Line Processing

H. B. Osborne Jr.—Recent years have seen a tremendous influx of foreign made materials and products into this country. We are all aware of the effects of their low prices on the business of many American companies—some have even given up on certain items such as concrete reinforcing bars and barbed wire. You can be sure that no protective tariffs will be imposed by our government, so the only answer lies in reducing our production costs.

We have perhaps gone overboard in automating machining operations; the area in which we have only "begun to fight" concerns processing of materials. Certain basic principles can result in lower labor costs and greater utilization of plant facilities. For example:

1. Never coil a material until you have done everything to it you must do before getting it ready to ship—keep it moving. Do all processing—heat treating, coating, drying—on the fly.

2. If you start with coiled stock, be sure you do everything to it you can before you cut it.

3. If you now start with cut stock, develop a process for handling continuous stock and process it as far as possible before cutting it to size.

One of the largest users of steel strip today is the can industry. It is moving slowly but surely in the direction of continuous coating and printing, but, today, we find miles of ovens and equipment handling cut sheets. It's inevitable that they will be replaced with continuous processing equipment.

The steel industry still adheres to many batch operations. Regardless of the process required, there is no reason to do it any way but continuously.

Everything we've said has reference to heating, for various reasons. A keen, critical look at the use of induction heating for such purposes clearly justifies its use whether it be at a few hundred degrees for drying of a coating (or preheating before coating), or high temperatures in the forging range. It is an economic and convenient way to introduce heat into a moving product using inches of space—such as drying 30 in. wide strip at 1200 fpm in a distance of 30 ft instead of handling cut stock in an oven more than 100 ft long.

Electronic Computer Aids Furnace Design

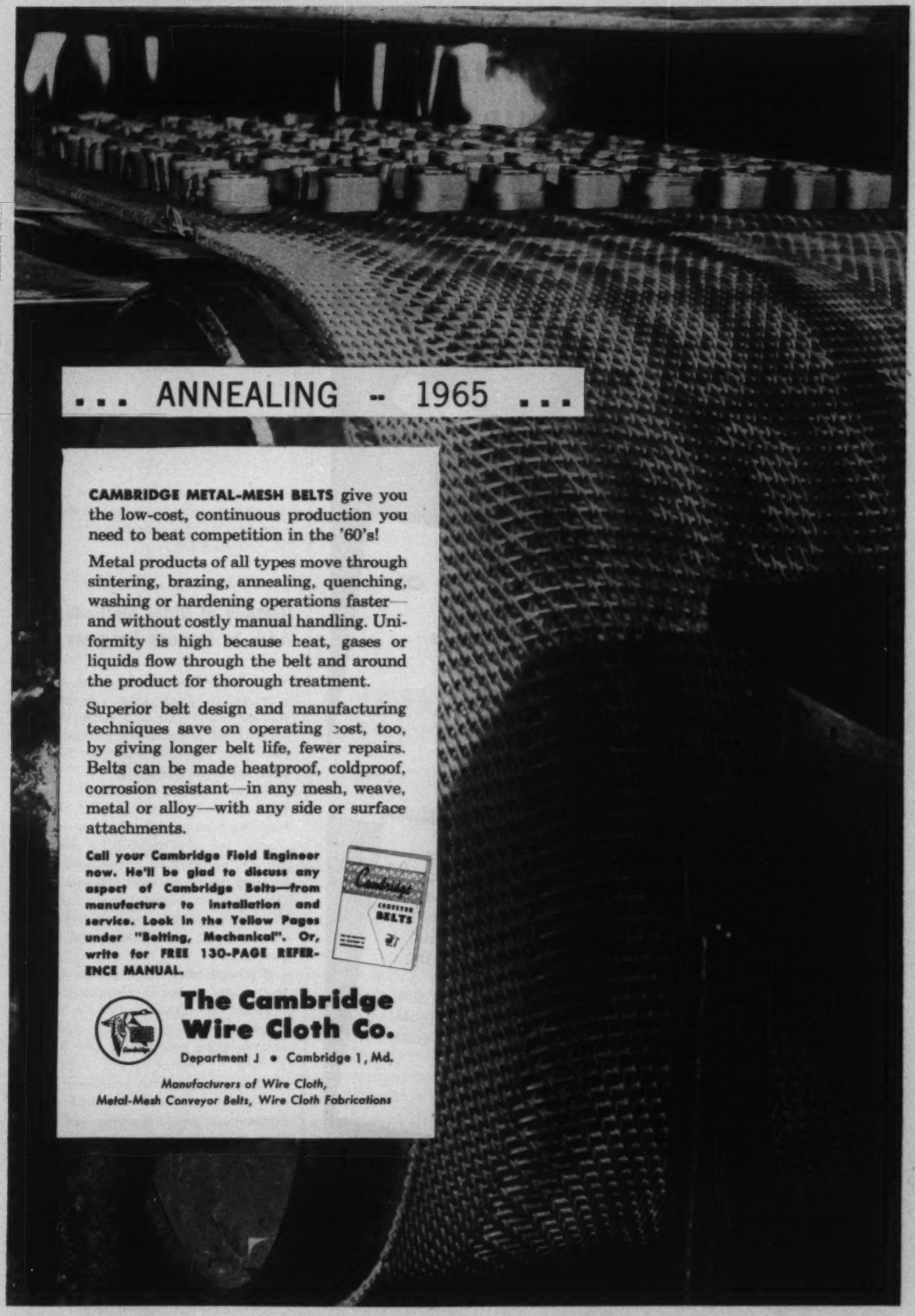
Henry M. Heyn—Last year, a special IBM electronic computer was used for complex engineering design problems in mechanics, aerodynamics, thermodynamics, metallurgy, heat transfer, and related fields. The data are being put to practical applications.

Although the electronic computer was developed by teams of technical men who were not fundamentally heating equipment experts, the impact of their accomplishments is greatly aiding the field of furnace design. The changes initiated by advanced methods of computation will be felt for many years to come and will benefit the entire metalworking industry.

Recent work has done much to produce the most effective convection power within industrial furnaces with the least horsepower input to the fan. The major factors are furnace design and a new approach to furnace fan construction. The object: Extremely high heating rates, under precise control, at lowest cost. It is possible to design furnaces with heat transfer rates limited only by the physical abilities of workpieces to absorb it, not our ability to produce and distribute heat.

In heating brass strip continuously at speeds up to 200 fpm, wind velocities of more than 135 mph provide the necessary temperature uniformity to control grain size from edge to edge. By locating fans within the furnace, and by careful design of air flow patterns, it is possible to maximize convection power in the furnace load, where it counts, and at the same time greatly reduce fan horsepower (and power consumption) from that required when external recirculation is used.

The same principle is applied in the design of smaller standard batch type furnaces. Exceptional uniformity, speed and flexibility of heat treating (regardless of


. . . ANNEALING -- 1965 . . .
CAMBRIDGE METAL-MESH BELTS give you the low-cost, continuous production you need to beat competition in the '60's!
Metal products of all types move through sintering, brazing, annealing, quenching, washing or hardening operations faster—and without costly manual handling. Uniformity is high because heat, gases or liquids flow through the belt and around the product for thorough treatment.
Superior belt design and manufacturing techniques save on operating cost, too, by giving longer belt life, fewer repairs. Belts can be made heatproof, coldproof, corrosion resistant—in any mesh, weave, metal or alloy—with any side or surface attachments.
Call your Cambridge Field Engineer now. He'll be glad to discuss any aspect of Cambridge Belts—from manufacture to installation and service. Look in the Yellow Pages under "Belting, Mechanical". Or, write for FREE 130-PAGE REFERENCE MANUAL.
Cambridge
CONVEYOR BELTS
The Cambridge Wire Cloth Co.
Department J • Cambridge 1, Md.
Manufacturers of Wire Cloth, Metal-Mesh Conveyor Belts, Wire Cloth Fabrications

DURALOY

DURASPUN

RADIANT BURNER TUBE ASSEMBLY

HERE WE HAVE A COMBINATION OF

1...statically cast bends and reducers

2...centrifugally cast tubes

3...machining

4...welding

This is indicative of the high alloy casting work we turn out at Scottdale. We can produce static castings up to 6 tons and centrifugal castings up to 24 inches in diameter (OD) and up to 15 feet in length (depending upon the diameter). We have excellent machining facilities and men skilled in the welding of the chrome-nickel alloys.

Our metallurgists will be glad to recommend the proper alloy for the casting you need to combat corrosion, high temperature or abrasion or any combination of these three.

The DURALOY Company

OFFICE AND PLANT: Scottdale, Pa.

EASTERN OFFICE: 12 East 41st Street, New York 17, N. Y.

ATLANTA OFFICE: 76—4th Street, N.W.

CHICAGO OFFICE: 332 South Michigan Avenue

DETROIT OFFICE: 23906 Woodward Avenue, Pleasant Ridge, Mich.

Heat Treating

W. H. HOLCROFT
President
Holcroft & Co.
Detroit

load density) are being achieved by using the highest air velocity to obtain maximum heat transfer consistent with application requirements.

Restudy of Older Methods Adds to Furnace Progress

W. H. Holcroft—In heat treating, we have a recurrence of old ideas. As new and younger men enter the field, they try many of the processes and practices which have been discarded and often find that some are again feasible.

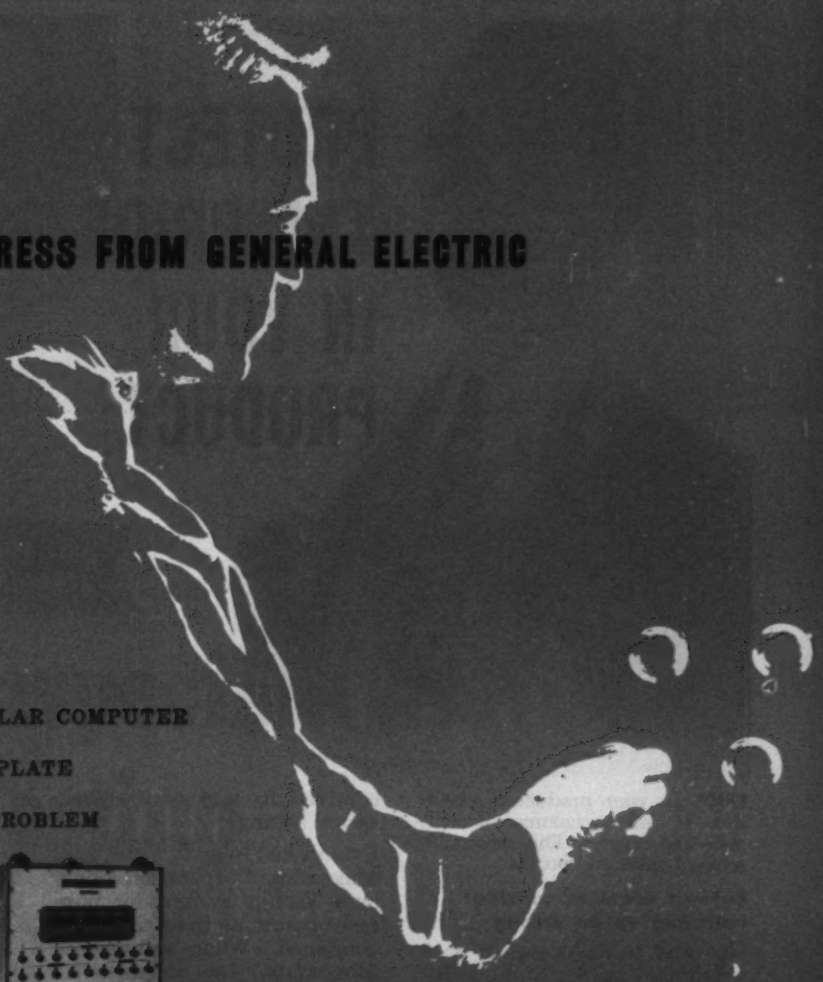
We are tending toward: Mechanical interlocks in preference to the electrical type; readoption of counterflow heat exchange; use of high velocity convection heating; use of high temperature radiant heating; design of larger diameter radiant tubes to allow higher temperature operation; continued use of silicon carbide rails and bearings; pusher chains, and live roll conveyors.

Every job and every process is being re-evaluated to see if it is possible to do a better job cheaper. While we continue to refuse to sacrifice quality for cheapness, we nevertheless have found it possible to reduce prices substantially while producing better equipment.

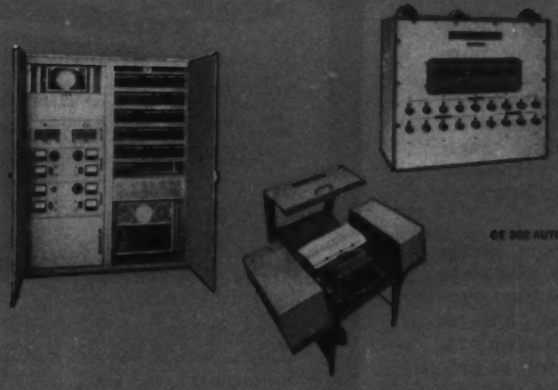
We have reviewed the field of high temperature gas carburizing and believe that its applicability at temperatures in excess of 1850° F is limited. Since most of our equipment has been designed for temperatures up to 1850° F, we anticipate that little or no design change will be required when using our equipment for high temperature carburizing.

In the coming year we expect to see further refinements of old ideas rather than anything completely new.

COMPUTER PROGRESS FROM GENERAL ELECTRIC



CUSTOM DESIGNING MODULAR COMPUTER COMPONENTS TO SOLVE A TINPLATE INSPECTION AND BILLING PROBLEM



GE 302 AUTOMATIC INSPECTION DATA ACCUMULATOR

The trend toward purchase of tinplate direct in large coils rather than sheets placed an unusually difficult inspection and billing problem upon manufacturers. The G-E 302 Automatic Inspection Data Accumulator—custom-designed by the Computer Department—solves this problem by electronically accumulating and tallying data from inspection sensors in a new solid-state system. The system is fully automatic ... provides a complete type-written record for quality control and billing purposes immediately upon completion of each coil.

Request brochure CPB-14B. Contact your nearest General Electric Apparatus Sales Division Office, or write to: Computer Department, Room 44 General Electric Company • Deer Valley Park • Phoenix, Arizona

Progress Is Our Most Important Product

GENERAL ELECTRIC

FOR FIGURES IN A HURRY—FIGURE ON A GE COMPUTER

CPB-14 (6-58)

PROTECT THE PRIDE IN YOUR PRODUCT

PRIDE in your product is essential. It builds customer acceptance and loyalty. This means increased sales and profits.

But—it requires constant watching to be strong

One way to make sure it does—is to set up *realistic* quality standards acceptable to you and your customers. The result is the elimination of needless or excessive rejects which can price you out of your markets, lose business, cut profits.

Magnaflux can help you do this through application of a nondestructive testing system designed to meet *your* needs. The testing can cover any design, engineering and production operation including tight specifications, job-lot or high speed processing. It applies to any solid material, metal or nonmetal—even to hardness, conductivity and alloy composition testing.

Established over 30 years ago, Magnaflux Corporation offers more Testing Systems for more test operations than all others combined. When you choose Magnaflux, your judgment is supported by leading engineers, production managers and testing laboratories everywhere.

Our service includes a recognized standard of complete and impartial on-the-job counsel, training courses, and research to meet individual requirements . . . as well as providing you a direct contact with some of the world's finest testing engineers.

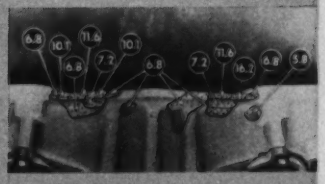
Talk to a Magnaflux Engineer . . . the sooner you do the sooner you'll be sure of *protecting* the pride in your product . . . do it *now!*

As your "House of Answers" Magnaflux offers you:

MAGNAFLUX-MAGNAGLO to test magnetic materials for cracks, seams, etc.

ZYGLO for nonmagnetic and other materials (Shown: Complete Portable Kit, $125.00)

SONIZON Ultrasonic Thickness Measuring



STRESSCOAT to find and measure stress on parts.

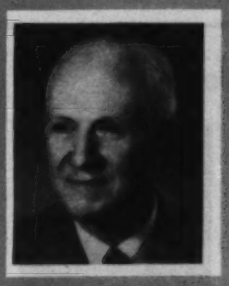
MAGNATEST electronic testing for hardness, conductivity, alloy, proximity, and many more.

And still other methods and techniques, some completely new.

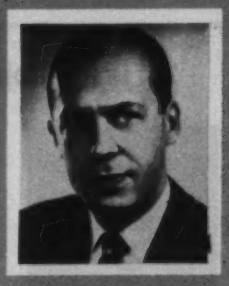
MAGNAFLUX CORPORATION
A Subsidiary of General Mills
7312 West Lawrence Avenue, Chicago 31, Illinois
New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 35 • Los Angeles 22

The Hallmark of Quality in nondestructive test systems

D. T. O'CONNOR
President, Society for Nondestructive Testing Inc. (Machlett Laboratories Inc.) Evanston, Ill.



FRANK G. TATNALL
Tatnall Measuring Systems Co. a subsidiary of Budd Co. Phoenixville, Pa.



E. ALFRED BURRILL
Vice President & Sales Manager High Voltage Engineering Corp. Burlington, Mass.

ARTHUR J. STEVENS
President
Radiation Engineered Services Norristown, Pa.

1960 FORUM ON TECHNICAL PROGRESS

Inspection and Testing

Society Publishes Handbook On Nondestructive Testing

D. T. O'Connor—The *Nondestructive Testing Handbook*, the first comprehensive treatment of the new science, is being published by the Society for Nondestructive Testing.

We feel that the most significant contributions to metalworking in the coming year are likely to come from the handbook. Problems of nondestructive testing are outlined and explained.

The handbook makes it possible to check every important advance in testing, to see how it may be applied and mechanized.

Engineers Expected to Use Environmental Testing

Frank G. Tatnall—Environmental testing methods to predict "in-service" performance will get increasing attention—conventional tests are not nearly good enough for tomorrow's products.

Testing has gone far beyond the polished laboratory specimen. A new kind of engineer versed in a new technology (call it "engineering mechanics") performs the work. The approach involves the experimental study of materials, stress and load analyses under conditions of maximum severity, of shape and size, mass, and stiffness.

The wide range of strange combinations used by the new testing generates additive effects which justify the cost.

These are some of the devices used: Free form machines; quartz lamps, thermoblankets, or induction heating; electronic shakers or unbalanced weight mechanical oscillators; bonded electric strain gages ; photostress (a photoelastic coating which shows strain patterns).

High Voltage Units to Expand Industrial Use of X-rays

E. Alfred Burrill—High intensity x-rays will have a considerable impact on industry during the next few years. Equipment manufacturers are concentrating on adapting new types of x-ray generators to in-line inspection systems which have been only partially successful with more conventional apparatus.

The routine evaluation, inspection, and re-evaluation of solid missile motors is an example of the kind of problem that can be solved by new, powerful x-ray equipment. Such motors are several feet in diameter, and the soundness of the solid propellent is important. With ordinary radiographic techniques, the complete evaluation of a single motor may require several days. The microwave electron linear accelerator cuts the inspection time several times.

Another development: Remote, continuous inspection of hot steel blooms. To inspect thick blooms for pipes and similar inclusions, one needs an x-ray machine of the electron linear accelerator type. Precision is important since bloom quality governs the quality of plates and sheets.

Predicts Heavier Cobalt 60 Sources in Hot Strip Mills

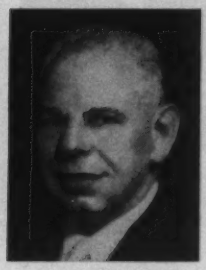
Arthur J. Stevens—Industry can expect an increase of about 25 per cent a year for smaller gamma radiography units (containing iridium 192 for thickness of 0.25 to 3 in. of steel or its equivalent) and the smaller cobalt 60 sources.

The large cobalt 60 units (up to 1000 curies) should begin to come into their

Inspection and Testing

WILLIAM D. KIEHLE
X-ray Div.
Eastman Kodak Co.
Rochester, N. Y.

WARREN J. McGONNAGLE
Group Leader, Nondestructive Testing
Argonne National Laboratory
Lemont, Ill.



A. L. GOBUS
Product Manager, Industrial Radiography
Philips Electronic Instruments
div. of Philips Electronics &
Pharmaceutical Industries Corp.
Mt. Vernon, N. Y.

JACK T. WELCH
Division Vice President
Sheffield Corp.
Dayton, Ohio

own in 1960 and offer a serious challenge to 1 and 2 million volt x-ray equipment. The much lower cost of such machines (less than $20,000 for machine and source, about one-fifth that of comparable x-ray) now puts high voltage radiography within reach of the smaller company. The proved radiographic quality of cobalt 60, the short exposure times (10 minutes for 8 in. of steel), and the small (1 centimeter) focal spot all indicate that it is coming into its own as a new tool for radiographic inspection.

The use of stronger cobalt 60 sources (to further reduce exposure times) is limited by economic factors. But machines containing 5000 to 10,000 curies should become available.

With practical gamma radiography extended to 1 ft of steel, scanning with cobalt 60 has only limited application and does not seem likely to see much use during 1960.

Isotope gaging on cold strip mills should increase in 1960, but an even greater upsurge is coming in hot strip mills: This year should see more experimental hot mill gage installations, with extensive use over the next five years.

The coming year should also see increased application of isotope gaging in tin plate, pipe, and nonferrous mills.

Radiography Will Get Boost in Four Areas

William D. Kiehle—Four factors should contribute to expansion of industrial radiography: 1. Availability of the linear accelerator (Linac). 2. Extended use of superfine grain, extrahigh contrast film. 3. Improved automation for film processing. 4. Neutron radiography.

The comparatively new linear accelerator will play an important part in the inspection of great thicknesses of materials, including stainless steel and exotic alloys (used in atomic reactors) and solid propellents.

Such radiographic problems demand extremely fine grain and high contrast film—which mean a slow film.

So far, radiography has proved the most effective means of testing honeycombs. An aircraft company is exploring "in motion" radiography for that application.

Neutron radiography, a new form of nondestructive testing, is still in the research and development stages. Practical use seems to be just over the horizon. The haphazard absorption characteristics of the neutron differ greatly from those of the orderly x-ray, which should make neutron radiography a valuable tool for inspecting missile and nuclear reactor components. The problem is the recording of the image. Today's films are generally insensitive to neutrons. A means of converting neutron energy to light, alpha, beta, or gamma rays is being sought.

Cites Technological Needs Of Nondestructive Testing

Warren J. McGonnagle—The rapid growth of nondestructive testing has come from industry demands for proved quality. Jet, missile, and nuclear energy needs have accentuated the demand.

Equipment and techniques developed in other areas must be adapted to the method. For example, sensitive infrared detectors have been developed by our Defense Department. They can and should be applied in nondestructive testing. New transducer materials have been developed to generate ultrasonic waves. New and more sensitive detectors for penetrating radiation are available. The characteristics of each must be further investigated and applied.

Developments in automation, electronics, and miniaturization should be adapted and applied. Present and future instrumentation must be simplified.

Nondestructive testing should undertake new fields, such as determining uranium content in reactor fuels.

Image Intensifier Expands Usefulness of Fluoroscope

A. L. Gobus—Fluoroscopy is a solution to time-cost problem of x-rays. It has found many applications, but the scope is limited by an extremely low light level, poor visual acuity of the operator, and rapid eye fatigue.

Image intensifiers have done much to alleviate those problems. The light level at the output screen is at least 1000 times brighter and allows observation of details not visible in a standard fluoroscope.

Sees Growth, More Variety In Ultrasonic Devices

Jack T. Welsh—Ultrasonics has been slowly evolving. Needed now are better instruments to record and measure the effects of high frequency vibrations on materials and to permit fast, accurate interpretation of the data.

Ultrasonic units that spot faults in metal will be joined by devices that analyze stresses and metallurgical changes in structures or machine parts. TV-type devices will present the data.

Multiple-channel instruments will be developed to enable several aspects to be recorded simultaneously.

Machine tools may be equipped with ultrasonics to constantly monitor size and tool wear and detect changes in the metallurgical structure.

Heavier gage metals and plastic foils

Inspection and Testing

HAMILTON MIGEL
Vice President, Research & Eng.
Magnaflux Corp., a subsidiary of
General Mills Inc., Chicago

JOHN C. SMACK
Assistant to General Sales Manager
Princeton Div., Curtiss-Wright Corp.
Princeton, N. J.

LOUIS A. WELT
President
Steel City Testing Machines Inc.
Detroit

VINCENT E. LYSAGHT
General Sales Manager
American Chain & Cable Co. Inc.
New York

will be ultrasonically spotwelded or seam-welded at hundreds of feet per minute.

The effects of high frequency vibrations on grinding are being studied so high strength, thermal resistant alloys can be handled.

Ultrasonic energy can be transmitted over long distances and around corners for remote operations.

Smaller, more efficient ultrasonic generators and transducers in inexpensive units will handle interchangeable tooling.

Fully automated ultrasonic machine tools, including workpiece loading and unloading of small components, are expected in the near future. Further cost reductions will be made through wider use of multiple ultrasonic cutting tools powered by a single unit.

Thermographic Method to Gain For Honeycomb Inspection

Hamilton Migel—Extensive use of stainless steel honeycomb in high speed aircraft has created a need for a fast and reliable method for testing the material. Aircraft such as the B-70 use up to 20,000 sq ft so it is essential that the test method be economical.

We foresee wide use of a new thermographic test called Bondcheck for detecting and permanently recording lack of braze, deformed core, and other irregularities in brazed stainless steel honeycomb sandwich. Temperature differential is indicated by a specially formulated fluid utilized by the method. The fluid is repelled by warm areas, is attracted to cool spots.

Core partitions act as heat sinks, causing the fluid to flow to each area of good braze. Where there is no braze, no pattern appears. The pattern is permanent unless removed with solvents.

The same method will probably be used on other brazed and welded products where relatively thin layers of metals are joined. It has already proved extremely useful in checking internally brazed joints on hollow stainless steel and titanium vanes for jet engines.

Another possibility: Spotwelds joining stainless steel members.

Standards for Defects Are Major Testing Need

John C. Smack—The next few years will see continued improvement in automatic, immersed ultrasonic testing and the recording of defects. Progress has been made in testing honeycomb panels. Similar progress is being made with missile components, welded pipe and tubing, and wheel shaped forgings. We will see further development of specialized equipment to increase efficiency.

We must use the full capability of available equipment and improve the application of test standards by obtaining more information on material strength. Too many defect standards are arbitrary.

Many companies still need closer co-operation between engineering and quality control. Product designs must lend themselves to economical nondestructive testing.

Further co-operation with foreign makers and users of ultrasonic equipment should yield important gains. It has already introduced betatron testing of large hot steel blooms with remote viewing.

Urges Putting Testing Equipment on the Line

Louis A. Welt—In testing physical properties, the biggest rewards are still ahead. Manufacturers are ready, but industry needs to understand the advantages to be gained by moving test equipment out of the laboratory and onto production lines.

As machine tools become more complex, automatic testing (integrated with production) becomes imperative. Present Brinell machines, for example, can be mounted in an early station on a transfer machine.

Some people are coming up with ingenious testing equipment applications. They are sometimes startling because they are based on equipment function rather than historical approaches.

Industry in general has been somewhat lax in looking at testing machines in terms of what they can do. Many new uses for single purpose testing machines and instruments are expected.

Air Operated Brinell Tester Is Under Development

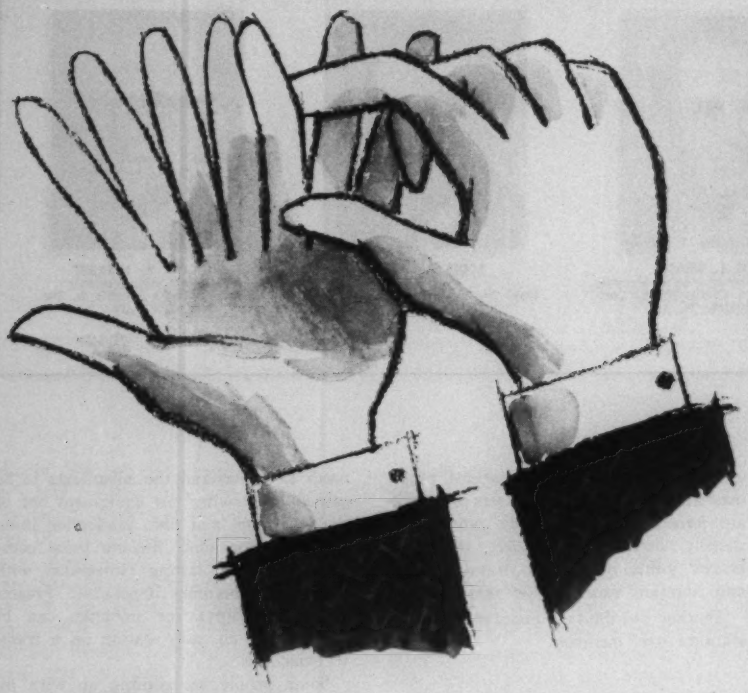
Vincent E. Lysaght—Mass production testing (up to 1000 per hour) with automatic equipment can provide results identical to those of hand operated Rockwell and Brinell machines. Above that speed the tests yield nonconforming hardness numbers, so engineers and metallurgists must open up their specifications if high speeds are required.

The trend in microhardness testing is toward production control. New equipment tests fine diameter wires and thin materials (to 0.0005 in. or less), determining hardness gradients in superficially hardened surfaces and exploring the hardness variations in small areas.

Another trend: Equipment to test bulky and irregular shapes and internal surfaces.

An air operated Brinell tester is in the laboratory stage. The unit will probably have certain economic advantages and require less maintenance than current

Tired of counting the excess?

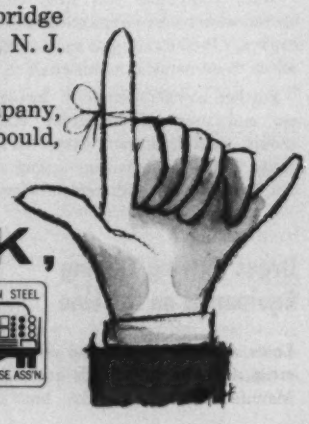


You save seven ways by using Wheelock-Lovejoy's *local* alloy steel warehouse facilities.

The usual costs of handling, cutting, storage, insurance, taxes, accounting, and—in some cases—obsolescence, are *all* eliminated when you order from your local Wheelock-Lovejoy Service Center. You can order your alloy steel—*as you need it*—in any size, shape or grade. See the listing below for the W-L Branch nearest you.

W-L STEEL SERVICE CENTERS—Cambridge
Cleveland • Chicago • Hillside, N. J.
Detroit • Buffalo • Cincinnati

AGENTS—Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal and Toronto



WHEELOCK, LOVEJOY & COMPANY, INC.
132 Sidney St., Cambridge 39, Mass.

AMERICAN STEEL WAREHOUSE ASS'N.

Inspection and Testing

J. E. REIDER
Manager, Metals & Mining Div.
Industrial Nucleonics Corp.
Columbus, Ohio

WALTER S. BAIRD
Chairman, Baird-Atomic Inc.
Cambridge, Mass.

types of testing machines.

We should also see more demand for portable hardness testers.

You Can Cut Your Costs Via Close Tolerances

J. E. Reider—Rising labor and material costs are putting intense pressure on industry. The improvement of profits requires aggressive investigation into new methods and systems.

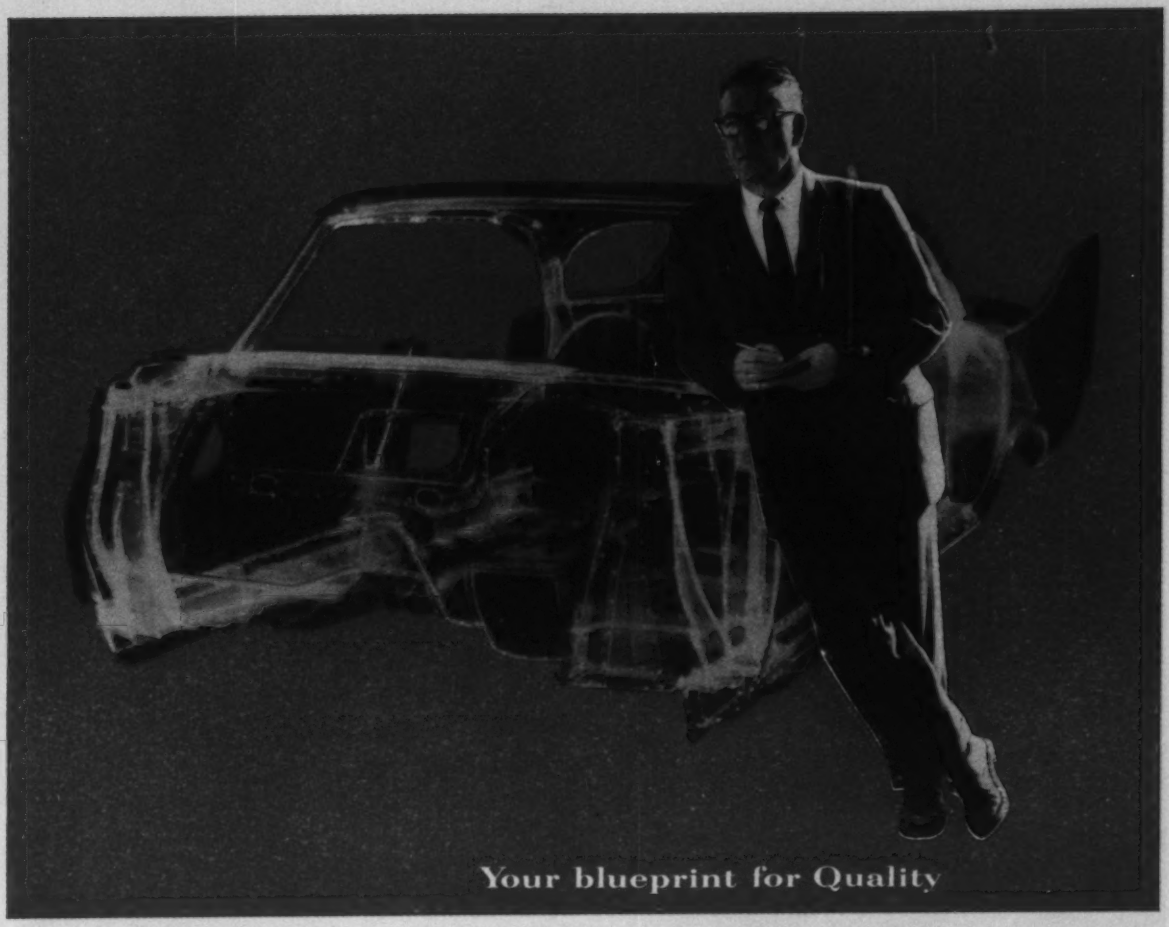
Close tolerance production, for example, is an area worthy of investigation.

One suggestion: The use of noncontacting isotope measurement and control systems for production.

Predicts Continued Gains In Emission Spectroscopy

Walter S. Baird—As predicted, direct reading, optical emission spectrometers are increasingly important because of savings afforded to melt shops in the inspection of new, untested materials.

Such instruments are going to be more prevalent in the control and manufacture of high alloy steels and high purity metals. Direct reading in percentage concentrations to parts per million, or research techniques using photographic plates allow a foundry or melt shop great versatility.

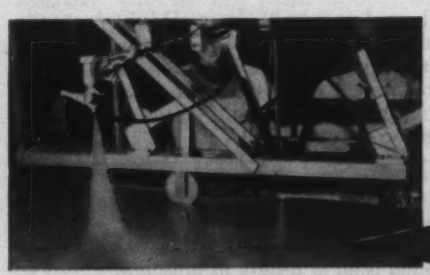


The Man is Sperry Ultrasonics

At Chrysler Corporation he collaborated with methods researchers to develop an improved ultrasonic inspection system. The new system, named SIMAC (Sonic Inspection Measurement and Control), automatically tests sheet steel for internal flaws in excess of 300 feet a minute. Flaws are marked by dye and the faulty steel rejected before it reaches the stamping phase. The resultant quality control assures the most perfect product with the least waste of man hours and material.

Sperry sales engineers are recognized authorities on the application of ultrasonic techniques in nondestructive testing. They are the link that sparks Sperry research and development teams to create the quality control tools industry needs.

When there is a quality control problem, call the man who is Sperry Ultrasonics.

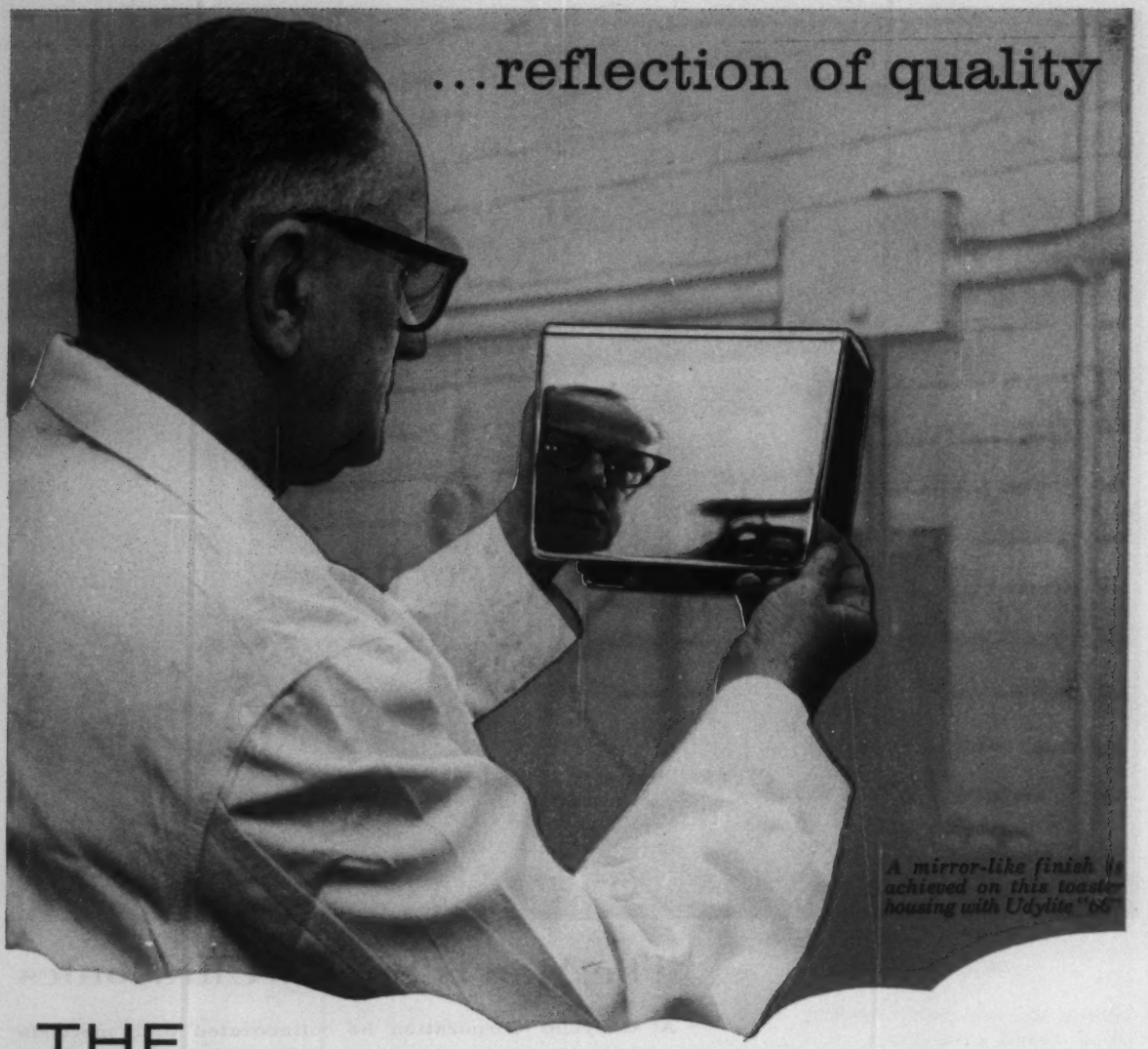


Defective sheet steel is automatically sprayed with dye on the production line at Chrysler's Nine Mile Stamping Plant.

Sperry Products Company

DIVISION OF HOWE SOUND COMPANY

901 SHELTER ROCK ROAD, DANBURY, CONNECTICUT



THE INCOMPARABLE "66"

Udylite's Bright Nickel Process "66" is sweeping the country with new installations and conversions to provide a truly incomparable plate with almost unbelievable ease of operation. The color of the process alone, sells "66" in any comparison.

The production of your existing equipment can be *greatly increased* with the introduction of Process "66". Its outstanding qualities include exceptional levelling ability and remarkable ductility for so bright a finish.

In addition, Process "66" has overcome the problems previously considered inherent in plating over semi-bright nickel and, it is unusually receptive to chromium. You'll find that the amazing adaptability of this very bright finish makes it suitable for your finest work . . . moreover it will save you money.

A phone call or letter will start Udylite's "66" Bright Nickel process on its way to help you improve your production. If it sounds too good to be true, just send us a sample of your product . . . we will be happy to test-plate it for you with Incomparable "66". Act TODAY!

SUPER "66" For even greater brightness and levelling where absolute maximum ductility is not demanded, Udylite's SUPER "66" may be specified. You must see this finish to believe its brilliance.

the udylite corporation

detroit 11, michigan • world's largest plating supplier

JOHN V. MOYNES
Vice President-Sales
Morse Chain Co.
A Borg-Warner Industry
Ithaca, N. Y.

FRANK H. FORD
Assistant Manager, Marketing Dept.
Turbo-Products Div., Clark Bros. Co.
Div. of Dresser Operations Inc.
Olean, N. Y.

J. ALLAN MacLEAN
President, Dodge Mfg. Corp.
Mishawaka, Ind.

EDMONDS LOVE
Manager, Industrial Control Sales
Industrial Controller Div.
Square D Co., Milwaukee

1960 FORUM ON TECHNICAL PROGRESS

Drives and Controls

Foreign Competition Will Spur Progress

John V. Moynes—Foreign competition in the domestic and export markets will motivate technological advancement. We must emphasize a better quality product with more and better sales and engineering services—and try to maintain present prices. The challenge requires technical advances in automation, product design, and selling.

Examples of needed improvements include the high speeds of chain drives (such as the Hy-Vo drive) and the high endurance qualities they offer. Such drives will aid engineers in design.

Greater speed demands, the need for compactness and portability will affect the coupling, clutch, and variable speed drive areas of power transmission products.

Gas Turbine Progress Tied to Metallurgy

Frank H. Ford—U. S. manufacturers have produced equipment (exclusive of locomotive drives) for more than 300 industrial gas turbine installations. In 1959, units were purchased by utilities and industry for power generation, by refineries for compressor drives, and by oil and gas companies for liquid pump drives on pipelines and centrifugal compressor drives on gas transmission pipelines. On both the liquid and gas pipelines, the material handled also serves as the gas turbine fuel.

There has been no major breakthrough in allowable operating temperatures, but several manufacturers have permitted operating temperatures of certain units to be increased in the range of 50 to 100° F.

Since operating temperature, efficiency, and design life go hand in hand, the gas turbine industry is dependent upon metallurgical improvements (particularly in blading).

Power Transmission Components Simpler, Smaller, Weigh Less

J. Allan MacLean—Trends in power transmission components emphasize simplicity of design, lower maintenance, space savings, and less weight and cost. One example is a line of smaller but more powerful V-belt drives introduced last year.

Drive manufacturers have developed such things as flexible cushion shaft couplings that require no periodic inspection or maintenance, dry fluid drives that provide soft starts and overload protection, and shaft mounted speed reducers with increased power and efficiency.

Such product improvements will enable manufacturers and processors to get greater production through plant modernization.

Controllers to Get Smaller; Module Design Gains

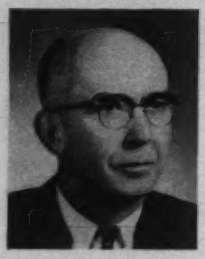
Edmonds Love—Controllers of conventional design will continue to be the major portion of new control equipment, but many will take less space and perform better than present types.

More adjustable voltage drives using semiconductors and saturable reactors will be used. Electronic tubes will probably continue to be used for the smaller horsepower ratings for some time. Emphasis will be increased on modularization of components for use as building blocks in complete packaged drives.

Increased automation in the mills will include the screwdown, other auxiliaries, and the main drive. Programing such as

Drives and Controls

PHILIP J. IMSE
Chief Engineer, Chain & Transmission Div., Chain Belt Co., Milwaukee



T. H. BLOODWORTH
Chief Systems Engineer, Electrical Application Dept., General Products Div., Allis-Chalmers Mfg. Co. Milwaukee

PAUL D. ROSS
Manager—Marketing, Direct Current Motor & Generator Dept., General Electric Co., Erie, Pa.

JOHN C. SEARS
Executive Director, American Gear Manufacturers Assn., Washington

preselector panel, punched tape or card, will be used. It may be extended to other operations such as blast furnaces and coke ovens. In the machine tool industry, more positioning controls will be used in the analog and digital forms requiring magnetic or punched tape for programing.

As the systems become more complex, the demand for greater reliability, more speed, and greater accuracy increases. For many years, the logic portion of controllers has employed electromagnetic relays, and while they will continue to be used because of their increasing reliability, there is a trend toward static switching devices (the magnetic amplifier or transistor type). It's felt that with the continued improvement of space saving transistors, their use in logic circuitry will increase. Again, the module idea will enable the control engineer to build up complex logic systems from standardized units.

Experience May Be Hindrance In Mechanical Drive Design

Philip J. Imse—In the application of chains, sprockets, bearings, and other mechanical drive components, untempered experience commonly leads to overdesign, which means poor economy and unnecessary design roadblocks.

Usually, manufacturers of metalworking and other equipment have a good idea of the average or normal loads applied to a drive. Just as commonly, little is known of the maximum loads or the entire load-frequency spectrum. Experience can tell us that a drive lasted five years, but equipment installed today is generally different from its five-year-ago counterpart in its load-frequency spectrum because of improved design.

Also, great strides are being made in increasing capacities of chains, bearings, and other drive components, and in the accurate knowledge of capacities such as wear, fatigue, and galling. For example, the endurance limit load of many common chains has been increased 50 to 100 per cent in recent years.

A joint program of the equipment and mechanical drive manufacturers to develop sound load information will certainly break down the "experience" barrier and open the door to many new, economical, practical drives and machines.

Programing Systems to Upgrade Metal Rolling Operations

T. H. Bloodworth—Programing systems will continue to lead to more efficient use of metal rolling equipment. Hot reversing mills will have computing controls to closely duplicate all manual rolling operations. When given the dimensions of the slab to be rolled and the finished product desired, they will compute the optimum rolling schedule. The operation will include full use of mechanical and electrical component capability. Rolling operations will be monitored by the programing brain and rolling schedules revised after each pass (if necessary) to obtain quality products in the fewest passes without electrical or mechanical overloading.

Hot strip mills will have similar programing equipment for the automatic control of roughing and finishing stands. Present mills with feedback gage controls and digital screwdown positioning can have the programing features added to them.

Increasing usage of rectifiers for direct current power on reversing hot mills and cold reduction mills will improve operation by bettering over-all response times. The power factor corrective system will be used on installations requiring rolling at reduced voltages.

Static power supplies will be favored for 250 dc mill supply service.

The importance of data logging equipment will increase. It will add to over-all knowledge of rolling problems and permit corrective signals to be fed back into the programing controls.

Packaged Electric Drives Cut Installation, Startup Time

Paul D. Ross—A new concept, called a "packaged power-control room," for electrical drives has conversion equipment, the control and associated regulators mounted on self-supporting floor sills. The unit is ventilated for installation near the drive.

The construction is for installation without foundations. Because of the flexible design of the equipment, it may be placed in areas generally unused, such as between building columns. Cables and electrical installation are reduced by placing the package near the process.

Steel companies are finding that the approach can mean savings in installation costs and startup time. Much of the mounting, wiring, and checking work on the packaged, adjustable speed drives is done in advance of shipment by the electrical supplier.

The heavy-duty packaged drives can be supplied with any type of alternating current to direct current power conversion.

Gearmakers Designing Smaller Gears to Handle Bigger Loads

John C. Sears—The trend toward heavier loads through smaller gears continues. Finishing of gears by grinding is increasing, permitting the use of higher

where moisture
and abrasion
meet **brightness**
that never wears out

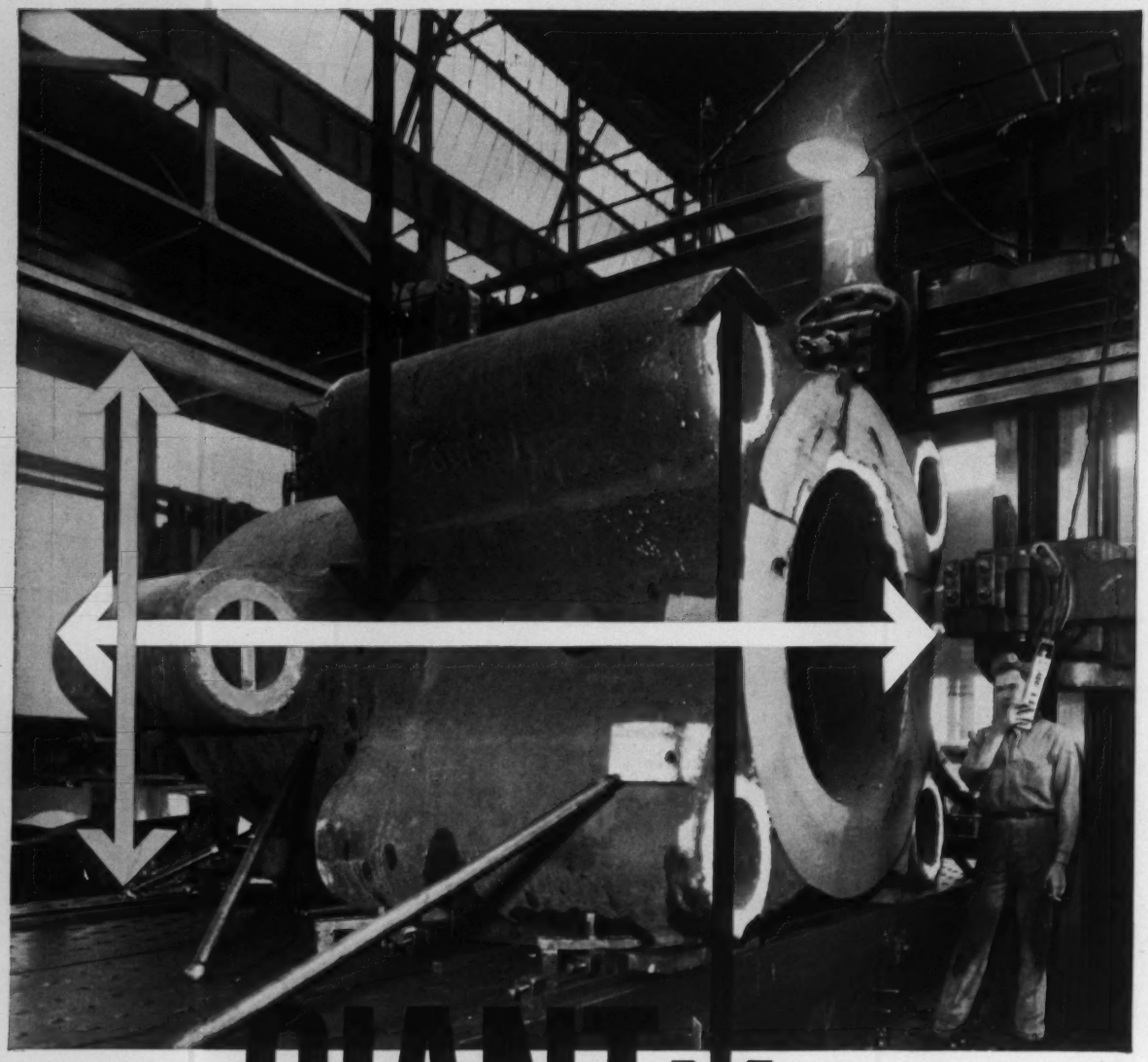
sink frames of

Superior

STAINLESS STRIP STEEL

At the toughest spot in the kitchen, Superior Stainless shows its metal best . . . the ever-bright, smooth gleam that asks no more than a wipe to reflect a housewife's pride. • Solid Superior stainless sink frames fabricate uniformly well because composition, dimensions and temper are uniformly as specified, every time. • We can serve you exactly as you wish. Ask us!

SUPERIOR STEEL DIVISION
OF
COPPERWELD STEEL COMPANY
CARNEGIE, PENNSYLVANIA
For Export: Copperweld Steel International Company, New York



GIANT

IN THE MAKING

Machining a giant press cylinder... The machining of this huge casting or the building of a complete machine, large or small, is the type of machine work regularly performed in SUN SHIP machinery plant where marine and industrial machinery is built.

We solicit jobbing machine work. Inquiries to our Sales Engineering Department will receive prompt attention.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE • SINCE 1916 • CHESTER, PA.

hardnesses in the teeth. Nodular iron is gaining acceptance as a gear material in a wide variety of applications.

Displacement of metal (hot and cold forming and rolling) rather than cutting is also being studied, particularly in high production shops.

One limiting factor in load carrying is lubrication. More attention should be given to lubricant quality and to the manufacturer's recommendation on lubricant type and frequency of change by the gear users.

Knowledge of factors which affect gear teeth capacity increases. Numerical values for the new factors are based on the latest and best available data, and may be found in AGMA's recent publication, tentative information sheet AGMA 225.01, *Strength of Spur, Helical, Herringbone, and Bevel Gear Teeth.*

AGMA is now in the final stages of developing a new gear specification manual that will enable designers and users to better pinpoint quality requirements, application, material, heat treatment, and related accuracy requirements.

Warehouse Finishing, Open Coil Annealing Lower Costs

Robert O. Gee—Custom production at economical cost is in the wind for 1960. Several recent developments point in this direction. Examples: Open coil annealing and more steel finishing by local warehouses.

Large continuous lines for annealing must run at peak production levels to be profitable. To effect the continuous part of the process, coils of strip are joined together and run through the furnace as an endless ribbon of steel. Continuous lines do not lend themselves to heavier gage material.

A recently developed process permits open coil annealing. The coils are individually uncoiled, then recoiled loosely. In a furnace, the loose or open coils are annealed efficiently and economically with even heating throughout the sheet. Advantages: Low cost of the annealing equipment, easy handling of heavy or light gage coils, and smaller floor space requirements.

Steel warehouses seem to be purchasing more finishing equipment. Progressive distributors are doing their own slitting and cold rolling. It means that they can stock fewer kinds of processed or finished steel to take care of customers' needs. They're finishing to order from a small but flexible inventory. The result: Fewer capital dollars tied up in steel stock.

Digital control is advancing in cut-to-length lines and classifying equipment. In classifying, the digital process control remembers what sheet has a surface defect and automatically rejects it after it passes the shear. On the cut-to-length applications, the digital control permits rapid, precise stops from full line speed without having to go through a lengthy slowdown.

Automatic gage control is another promising development for steel mills. Continuous accurate measurement of the strip is fed back in the form of an electrical signal to a regulator which has been "told" what the gage of the strip should be.

If there is any discrepancy, the regulation and console system automatically governs the screwdowns, back tension, or speed to correct the error and keep the gage constant.

Hydraulic Rotary Drives Provide Precise Control

Wilbert G. Prasse—Greater use of fluid power pumps, cylinders, and valves will continue in the hydraulic press and machine tool fields. Larger, two way variable displacement pumps with remote, precision controls will better meet cycle requirements of higher tonnage presses. Improved valve designs will reduce power losses and help press performance. Electrohydraulic, servocontrolled pumps, responsive to tape or electrical devices, will economically equip machine tools for both large and small production requirements.

Hydraulic, positive displacement rotary drives with precise remote controls have found expanded acceptance and will prove to be the only practical solution in many new fields.

Here's what hydraulic drives can do: 1. Synchronize. 2. Handle web materials that are soft and fragile at one point and strong at another. 3. Control tension for improved quality control. 4. Provide greater speed ranges and accurately control slow speeds (1 rpm) irrespective of torque, viscosity, or voltage changes.

In 1960, the steel industry will witness the first Hytac fluid power sectional drives applied to a tube mill.

Integrated Motor, Controls Save Weight and Space

Charles C. Libby—Integration of motor and control equipment into the body of the driven machine will continue. More equipment using direct connected motors will be redesigned to incorporate the motor.

Special control equipment will be integrated into the machine to simplify operator tasks and insure maximum motor performance over the duty cycle.

Special mechanical motor designs will be used more. They include shell type, hermetic, airstream, submersible, and partial motors. The use of flange mounted motors in reduced frame dimensions may also be expected to gain. For example, the low silhouette design pioneered by the axial air-gap motor will be available in more horsepowers and in a variety of modifications in conventional flat, pancake, or wafer types.

Some electrical modifications are available because of recent developments in insulation and magnetic materials. They may help solve motor integration problems.

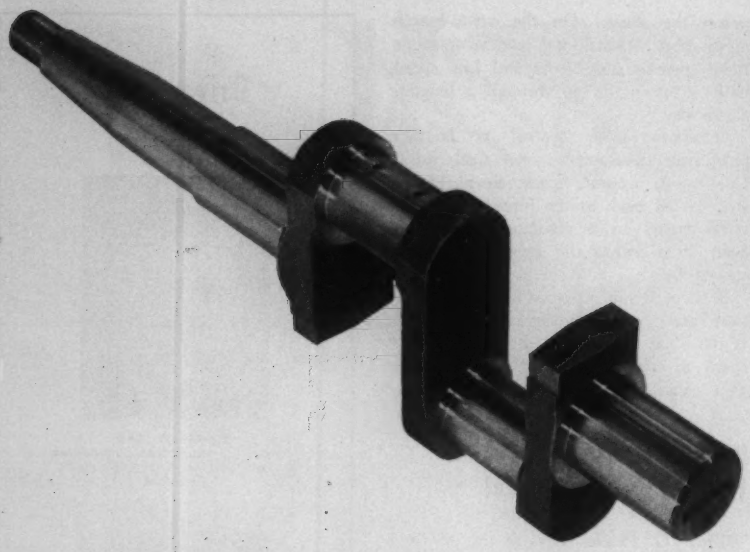
Within the next few years solid state switching elements should be available for incorporation directly into the motor, with ratings capable of handling motor currents. Use of these control units as

Drives and Controls

ROBERT O. GEE
Manager of Application Engineering
Reliance Electric & Engineering Co.
Cleveland

WILBERT G. PRASSE
President, Oilgear Co.
Milwaukee

CHARLES C. LIBBY
Sales Manager, Electrical Div.
Fairbanks, Morse & Co., Freeport, Ill.



DUCTILE IRON SAVED MONEY

This seventy pound ductile iron crankshaft was made for air compressors manufactured by The Brunner Division of Dunham-Bush, Inc. The increased loads and impact resistance called for by new compressor design specifications required rigidity and strength beyond the limits of the cast iron alloy shafts formerly used. Ductile iron was chosen because the rigidity, yield strength and wear characteristics comfortably exceed operating requirements.

A major cost advantage was realized in this case. Hamilton Foundry used existing pattern equipment made for the gray iron crankshafts in the switch to ductile iron. This saved the cost of new foundry patterns and the greater cost of dies needed for steel forgings. Dunham-Bush achieved a major improvement in product performance for the modest additional cost of the metal in the castings.

When new and unusual design problems arise in the selection of metal and the casting of parts, you will find that the skill and integrity of your foundry is your best insurance that specifications—and delivery schedules—will be met.

GRAY IRON • ALLOYED IRON • MEEHANITE® • DUCTILE (NODULAR) IRON • NI-RESIST • DUCTILE NI-RESIST • NI-HARD

HAMILTON FOUNDRY INC.

1551 LINCOLN AVENUE • HAMILTON, OHIO • TWinbrook 5-7491

Drives and Controls

PAUL W. NORRIS
President, Denison Engineering Div.
American Brake Shoe Co.
Columbus, Ohio

an integral part rather than an accessory might be an important development.

On separate motors larger than 100 hp, the machine designer will be able to get more insulation systems, ventilation systems, lubrication systems, and motor enclosures.

It's getting more difficult to select equipment from this wide array to get the lowest operating cost. In addition, some motor designs may be offered without adequate field trials, or without sufficient information.

A trained motor application engineer is becoming more important to the user or seller. It's more important than ever to select the optimum combination of electrical and mechanical modifications of drive motors.

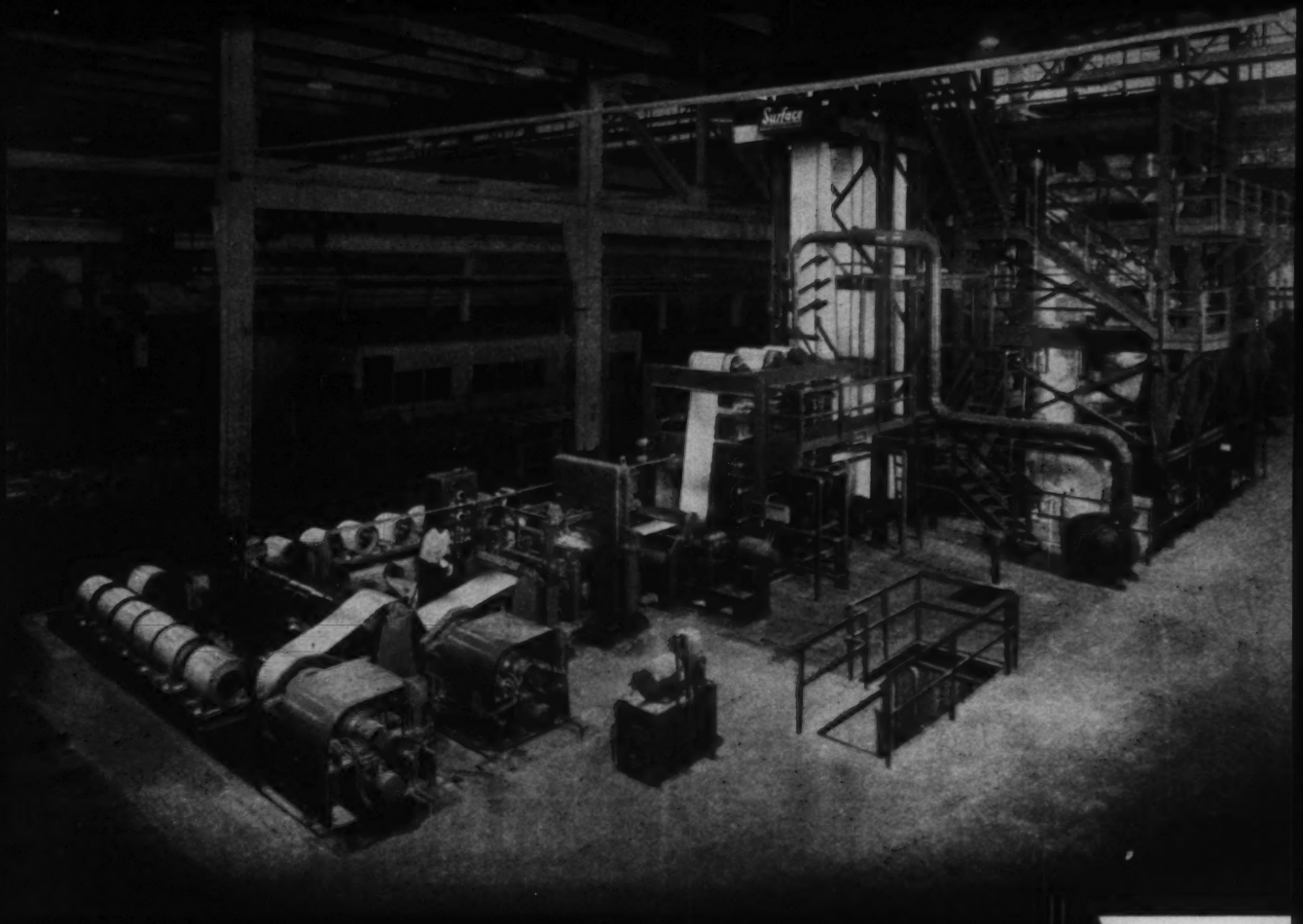
Pumps, Controls Will Gain In Domestic, Foreign Markets

Paul W. Norris—In 1960, buyers of heavy machinery will begin tooling up for a decade of tremendous industrial production. It means that our Multipress Div. (manufacturing hydraulic presses) should have an excellent year.

Hydraulic pumps and controls will have broader use in present markets and will enter new ones. Substantial increases are expected in marine, missile, and earth-moving fields, to name a few.

During the coming year, we expect sales of Denison hydraulic products to be appreciably increased in the European market. Through Brakeshoe International, our products will be both manufactured and sold in Europe.

New research facilities, to be opened early this year, will be devoted to developing today the complex hydraulic and electronic systems required for tomorrow.



SURFACE POWER CONVECTION achieves uniform grain size at unprecedented speeds

This Surface line is designed to continuously heat brass strip at speeds up to 200 feet per minute.

But unprecedented process speed is not the only profit which can be credited to Surface Power Convection, which heats the strip. Equally important are uniform control of grain size from edge to edge, and improved surface quality.

The key to such high-speed high-quality production is the tremendous wind velocity achieved by Surface Power Convection. In this furnace, wind speeds reach 136 miles per hour—a velocity unheard-of in convection furnaces up to now.

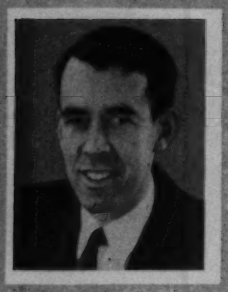
And the best news about Surface Power Convection is that it can be applied to virtually any type of heat treating equipment you can think of—batch or continuous, direct or indirect fired, straight air or atmosphere.

You know how higher speeds and better quality could improve your profits. Surface Power Convection will give you both. Write for Bulletin SC-182.

SURFACE COMBUSTION · 2385 Dorr Street, Toledo 1, Ohio
A DIVISION OF MIDLAND-ROSS CORPORATION

In Canada: Surface Industrial Furnaces, Ltd., Toronto, Ontario

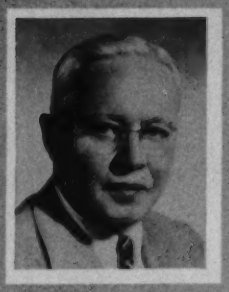
Surface



JAMES H. FLANDERS
Ass't. to the President
Jones & Lamson Machine Co.
Windsor, Vt.

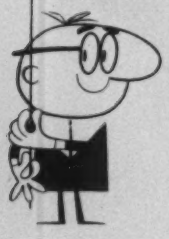
JOSEPH H. BUHR
President
Buhr Machine Tool Co.
Ann Arbor, Mich.

J. R. KEATES
Vice President, Sales
National Automatic Tool Co. Inc.
Richmond, Ind.



GEORGE H. JOHNSON
President
Gisholt Machine Co.
Madison, Wis.

1960 FORUM ON TECHNICAL PROGRESS



Machining

Absence of Downtime Is Builder Goal

James H. Flanders—Machine tool builders can make the biggest contribution to productivity in the next few years by working to reduce machine downtime. Today's more productive machining equipment represents a large investment. Every possible effort must be made to keep it operating at a maximum level.

Numerical control has a big contribution to make because in many applications it eliminates long setup times. Also, the fact that the machines tend to be completely automatic means that the cycle time can often be reduced to a consistent, predictable level.

In grinding, the application of perpetual form-control truing equipment with rotary, diamond impregnated cutters for forming grinding wheels has resulted in lower downtime.

Multioperation Machines Aim at Cost Squeeze

Joseph H. Buhr—Demand for multiple operation machine tools will continue to rise in the next year as manufacturers try to stem the trend to higher costs and lower net profits. The demand could lead to increased automation, extending more and more to automatic assembly and perhaps even to automatic loading and unloading. Resultant design requirements will pose additional problems for machine tool builders.

Technological problems will arise as more complicated machining jobs and a larger number of operations are incorporated in multiple operation machine tools.

Machine tool manufacturers also face the immediate problem of incorporating changes in their basic building block standards to meet new industry standards. The changeover will be a gradual one but will probably be completed during 1960.

Transfer Lines Will Move To Medium Production Shops

J. R. Keates—Our concern is turning more and more toward automating the medium-production metalworking manufacturer.

We have built a great deal of highly automatic machines for high production industries and many, including those numerically controlled, for low production industries. Not too much has been done for the manufacturer who falls in between.

We visualize transfer lines in these plants—lines of standard machines with transfer devices between them. Each machine would have its own hydraulic and electrical system and could be put into the line or removed, depending on whether its operations were needed in machining the part. The self-contained machine, once removed from the line, could be used elsewhere in the plant.

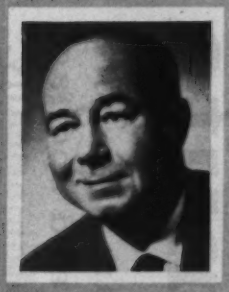
This is not a new concept but one that needs urgent revival to meet the medium production requirements.

Economic Pressure Forces Technological Speedup

George H. Johnson—This year should be one of increasing activity for metalworking because great forces are being applied to America's production facilities. The capacity race between the USSR and our country is one source of pressure. Another is the ever growing foreign

H. GLEN BIXBY
President
Ex-Cell-O Corp.
Detroit

J. P. CROSBY
Vice President, Sales
Lapointe Machine Tool Co.
Hudson, Mass.



DON S. CONNOR
President
Micromatic Hone Corp.
Detroit

RALPH E. CROSS
Executive Vice President
Cross Co.
Detroit

competition. Further, our own exploding population is providing a growing demand for consumer goods. Added to that is the continuing rise in labor costs, exaggerated by a shortage of production workers.

To withstand the pressures, to meet the demands for more goods, and to get a fair share of the consumer's dollar, all segments of metalworking must be committed to a continuous program of research and development. In one survey, nearly 50 per cent of the machine tools in operation were found to be obsolete. They must be replaced by new equipment having more automatic operation, higher operating speeds, greater rigidity to handle the tough new metals, and be arranged to utilize the newest tooling developments to the fullest extent.

Machine tool builders are working toward the 1960 Machine Tool Exposition. Many developments introduced will be two or three years ahead of their time.

Numerical Control Shares Honors with Building Blocks

H. Glen Bixby—We believe that numerical control and the increasing use of standardized building block construction will have the greatest impact on metalworking in the near future.

Numerical control is emerging from the glamour stage and settling down to its rightful position of turning out parts. Situations in which numerically controlled machines should be considered are: Short run or moderate production of a variety of parts; components that normally would require large, complex, and expensive fixtures; parts requiring accuracy that can be obtained by conventional machines only with time consuming methods that call for a high degree of machinist craftsmanship. The latest controlled-path-type numerically controlled machines have accuracy that surpasses the expert touch of the best machinists. For example, a 3000 lb slide can be moved in increments of 25 millionths of an inch.

Industry-wide standardization of special machine components will increase their acceptance. We have always utilized standard machine units in transfer machines and have been successful in changing them to accommodate new work. But customers are inclined to think of transfer machines as "special" and therefore expensive. The publicity concerning standardized building block construction has helped to stimulate thought in the field of automation and to combat the fallacy that transfer machines are necessarily expensive, inflexible specials.

Broaching Emphasized For Small Job Shops

J. P. Crosby—Even though increase in productivity by the broaching method has been the greatest of all machine tools in the last ten years, it will show tremendous advances at the machine tool exposition.

Small, inexpensive broaching machines will predominate. The small job shop operator is becoming more familiar with broaching, and most of the machines will satisfy his needs and his pocketbook. There will be more and more universal machines that can be easily adapted to surface and internal broaching.

For the larger production shops, broaching applications in automated production lines will be found to a greater extent than heretofore. There will be more machines with automatic feeding, gaging, and unloading.

Scientific Research Analysis Speeds Development Pace

Don S. Connor—The next year will be one of the busiest and most eventful that the machine tool industry has ever experienced. Mounting economic problems facing metalworking, new techniques that challenge conventional machining and tools, and the research and development programs underway all will lead to machining innovations.

The time which elapses between an idea in research and development and the appearance of the resulting product in the user's plant will be cut substantially within the next two years.

New electronic measuring equipment, first used in missilework, and advanced techniques are enabling us to study the physical phenomena involved in the Microhoning process. The cause as well as the effect can be seen as the data are recorded in process. Variables are independently noted on a multiple channel recorder on a common time base, permitting analysis of phenomena to be made in days rather than months or years.

Three Moves Needed To Cure Economic Ills

Ralph E. Cross—American industry's major problem in 1960 (and probably beyond) is not technological but economic.

Advances in technology demand constant change—the turnover that develops out of the application of new and better ways to produce goods. Consider the costs of these changes—for which industry must invest $40 billion annually in plants and machinery to maintain the jobs that are in existence today and to provide jobs for the 400,000 to 500,000 people entering the labor force each year. Every new job costs from $12,000 to $15,000, and every job in existence requires an annual investment of $450 just to keep it going.

Technological advances will continue, but capital to finance the application of these advances in the U. S. is diminishing. Foreign competition is forcing more and more American companies to build

(*Please turn to Page* 264)

Milwaukee-Matic

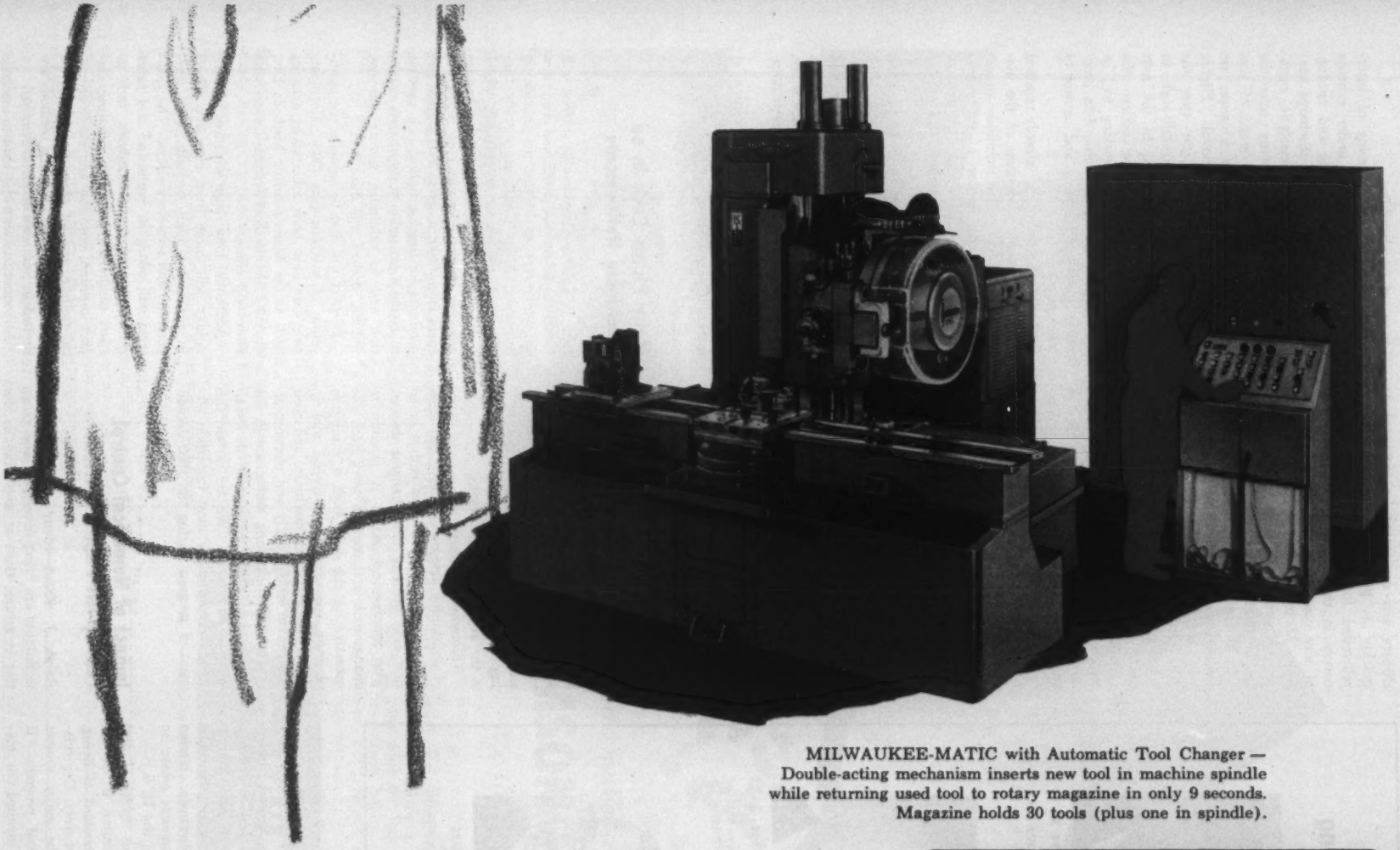
– "Just A Minute

. . . while I mill, drill, ream, tap, bore, counterbore, countersink and spotface a part automatically."

"Sure, the job could be done on a variety of separate machines and fixtures — plus a lot of expensive setup and transfer time . . . but why make a project of it? With the Kearney & Trecker MILWAUKEE-MATIC, you do the whole job automatically, on a single integrated machine . . . under numerical control, of course. With punched tape control, each workpiece is precision-finished exactly like the one before it . . . accurate to tenths."

If your schedules call for small- and medium-lot runs of parts requiring a variety of machining operations, you'll want to know more about the profit-producing MILWAUKEE-MATIC . . . a new manufacturing concept. Investigate, and you, too, will be saying, "Just a MILWAUKEE-MATIC minute . . . while I mill, drill, ream, tap, bore . . . "

Write for complete literature file or call your local Kearney & Trecker representative today.



MILWAUKEE-MATIC with Automatic Tool Changer — Double-acting mechanism inserts new tool in machine spindle while returning used tool to rotary magazine in only 9 seconds. Magazine holds 30 tools (plus one in spindle).

Numerical Control Division

KEARNEY & TRECKER CORP.

6800 West National Avenue • Milwaukee 14, Wisconsin

Phone — GReenfield 6-8300 . . . Direct Distance Dialing Code No. 414

KEARNEY & TRECKER MILWAUKEE

Machining

HENRY D. SHARPE JR.
President
Brown & Sharpe Mfg. Co.
Providence, R. I.

RALPH J. KRAUT
President
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wis.

JOHN F. KAHLES
Vice President
Metcut Research Associates Inc.
Cincinnati

(*Concluded from Page 261*)

plants and invest capital dollars abroad. In many cases, it costs less to make a U. S. product in Europe and ship it back than it does to make the same product here. And, obviously, foreign plants and capital investments create no jobs and pay no taxes in the U. S.

There are three areas which I feel deserve our utmost attention if we are to maintain our high standard of living.

1. Accelerate capital recovery. Depreciation provides one of the major sources of funds for technological progress. It is essential that capital invested for machinery and equipment be recovered as quickly as possible so that it can be reinvested for growth. Yet capital recovery in the U. S. is still the slowest of any country in the world—requiring from 12 to 30 years on machine tools as compared with four to eight years in the industrial countries of Europe.

2. Eliminate featherbedding. American industry is threatened with competition from abroad. In metalworking, the American factory worker is paid four to six times more than his European counterpart. Add to this handicap certain make-work and featherbedding practices which I estimate waste 25 per cent of our production effort, and you have a situation which no amount of technological progress can completely counteract. Industry needs a fair day's work for a fair day's pay.

3. Provide adequate incentives for success. There seems to be a passion for equality that dilutes initiative and stifles progress. It exists in our tax laws, our labor contracts—and even in our schools. This philosophy offers no reward for extra effort, and extracts no penalty for lack of effort. Much could be done today—particularly among our younger people—to restore enthusiasm for individual accomplishment and to re-energize the need for recognition and success through personal effort.

Jigless Machining Set To Boost Productivity

Henry D. Sharpe Jr.—One of the things of greatest import in the metalworking field today is the rapid rise of jigless machining, combined with rapid, automatic tool change. The day of expensive, single purpose tooling is fast ending. High productivity for short runs is the keynote as 1960 begins.

Throughout industry many novel types of positioning devices, expensive and inexpensive, are being combined with a broad new assortment of tool changing devices. The arrangement makes it possible to change tools and position work from one operation to the next with a minimum of time and almost no special tooling.

Our turret drilling machines, and their companion mechanically and electronically operated positioning tables, are in the vanguard of a new basic trend in metalworking equipment. We are certain this trend will form the most important element of progress during the 1960 decade.

Impact of Numerical Control Felt by All Plant Functions

Ralph J. Kraut—Many metal shaping techniques are being developed, and progress is greater than at any time in the history of metalworking.

Flow turning, cold forming of internal and external shapes under extreme pressure, explosion forming and cutting, chemical milling, electric discharge machining, and reverse electrolytic metal removal are rapidly moving into the practical and economical stage of use.

In addition, tremendous advances are being made in chip removal. Higher speed cutting tools are just over the horizon, and a major breakthrough in this field can be expected in the next few years. However, we believe the greatest impact on metalworking will be the extended use of electronic data processing in the programing and control of machine tools.

Numerical control is already applied to a considerable percentage of the machines being sold. The technique attacks the nonproductive portion of the manufacturing cycle, the largest portion of the total. Properly applied, this control will allow the machine to cut two to three times as much in a given time.

The impact of this technology does not stop at the machine. It will affect machine grouping, toolmaking and maintenance, labor quantity and grade, training methods, methods and time study, inventory, product design, and even management itself.

The 1960 Machine Tool Exposition at Chicago will probably be called the Numerical Control Show.

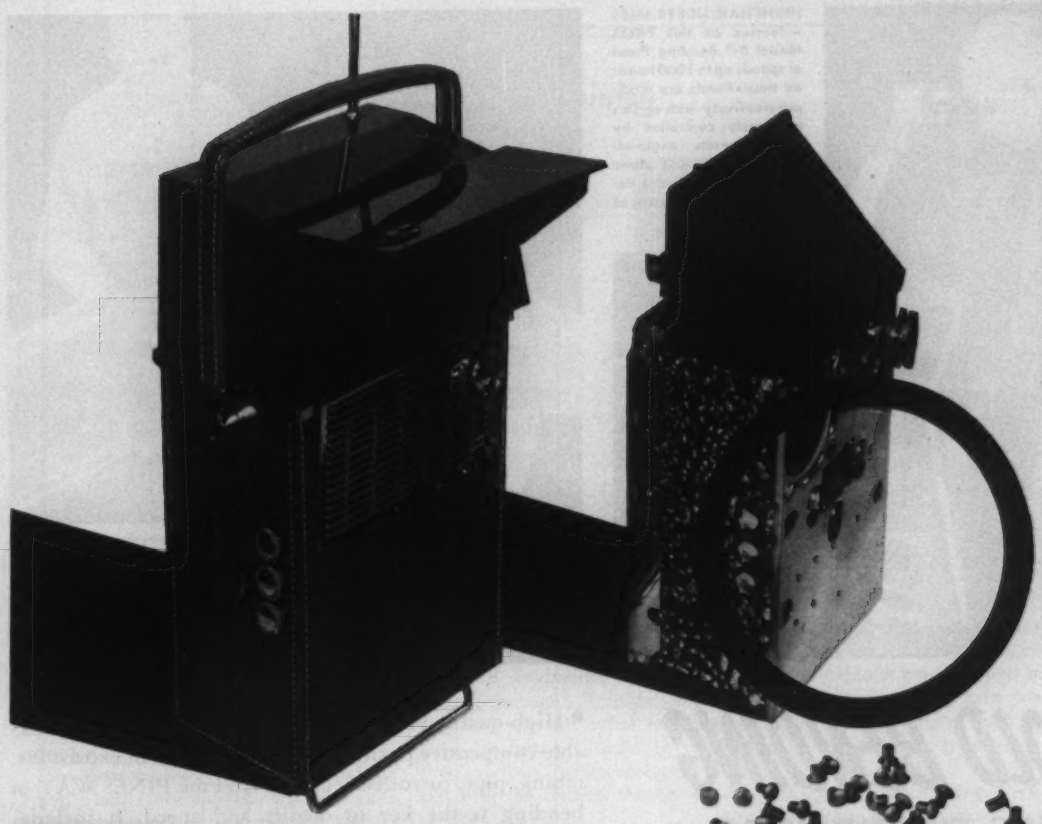
Many Plants Cash In on Machining Refinements

John F. Kahles—Considerable interest will be shown in residual stress and distortion of workpieces as related to machining processes. Many plants are already cognizant of the value of reducing wheel speeds in finish grinding to minimize grinding stresses. By reducing the wheel speed from 6000 to about 2000 surface feet a minute for finish grinding, it is possible to create a favorable surface stress condition and to minimize surface damage, residual stresses, and distortion.

Progress will also be made in the application of machinability data. Considerable data have been collected by agencies such as the Manufacturing Methods Div. of AMC Aeronautical Systems Center, and more will come.

Additional long range advances in technology will come from extensive efforts in machining high strength, high temperature, and refractory alloys. The problems will result in perfection and more general use of special methods, such as spark discharge, electrolytic grinding, impact abrasion, chemical and electrochemical milling, and jet abrasion. It may be recognized, however, that the methods are limited to low rates of metal removal.

In connection with the hard-to-machine



When Philco makes a "Safari" . . .

THOMSON RIVETS

are there!

The "Safari" is the first battery-operated television set to reach the market. This truly is a light-weight, miniaturized step forward in the television industry.

Philco's advanced research and engineering puts television on a "view as you go" basis. Judson L. Thomson Mfg. Co. . . . pioneer in rivets and riveting machines since 1885 . . . salutes one of its best known customers for this notable achievement.

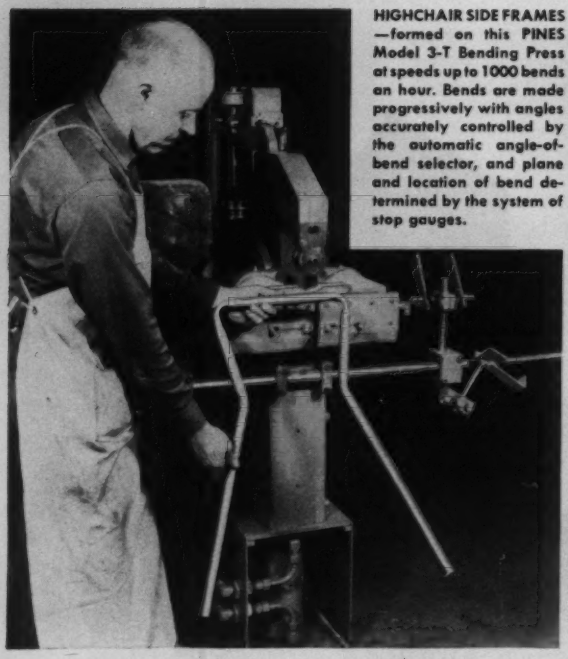
Why use Thomson Rivets? Value analysis proves that rivets belong in product-improvement and cost-reduction programs. No other permanent fastening method can match the combination of fastening strength, assembly speed and inspection ease inherent in riveting. From first cost to last, it rates first consideration.

Judson L. Thomson Mfg. Co., with seventy-five years' experience in engineering rivets and machines to new or existing product demands, offers a plus no other source can top. More than 8000 rivet specifications and more than 200 machine models assure ready answers to your fastening problems.

For help in selecting the right rivet and machine, call the Thomson Fastening man in your area. He's listed in the Yellow Pages of your phone book. In the meantime, you'll want Thomson's new handbook in your files for day to day reference. The coupon below, attached to your company's letterhead, will bring it to you by return mail.

Judson L. **THOMSON** Mfg. Co.
22 Sawyer Road
WALTHAM 54, MASSACHUSETTS

- ***Please rush your new handbook "Cost-Cutting Facts about Fastening with Rivets."***
- Name_____ Title_____
- Company_____
- Address_____
- City_____ Zone_____ State_____



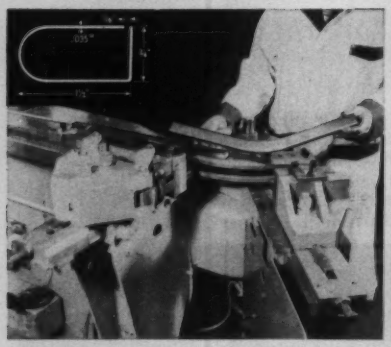
HIGHCHAIR SIDE FRAMES—formed on this PINES Model 3-T Bending Press at speeds up to 1000 bends an hour. Bends are made progressively with angles accurately controlled by the automatic angle-of-bend selector, and plane and location of bend determined by the system of stop gauges.

A DIFFICULT ALUMINUM EXTRUSION BEND—Preventing distortion and warping was difficult in making this 90° bend in 6063-T6 aluminum on a 9⅜" inside radius. A split-type bending die and link mandrel, on a Model 2 machine, produced wrinkle-free bends with no distortion.

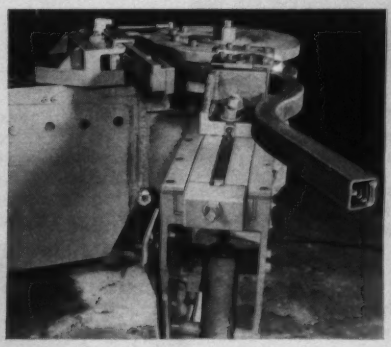
COLD BENDING
THE PINES WAY
Can Help You Remain Competitive

• High-quality bends at high speed is the key to a favorable competitive position in the fabrication of extrusions, tubing, pipe, or rolled sections. And the PINES WAY of bending is the key to quality and speed. It includes superior design, tooling to suit the job, provisions for quick setup, and competent service.

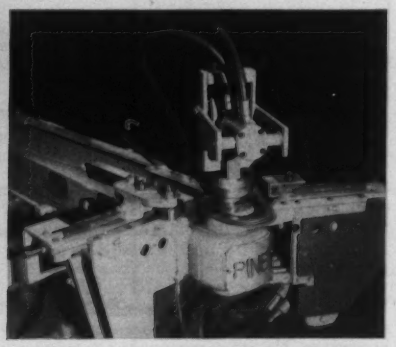
Some examples of the results of these factors are illustrated here. Whatever your metal-forming needs may be, it will pay you to investigate bending the PINES WAY. For assistance on your jobs or a cost analysis, call on Pines without obligation.



D-SHAPED STEEL CHANNEL—Unique tooling permits edge-bending without closing the ⅛" slot. 37° bends are made on a 9" inside radius to form side rails for playground slides. Done on a Model 1¼ Bender.



SQUARE-TUBE VEHICLE FRAMES—Bending of SAE 4140 steel tubing, 3" square x .239" wall on 10½" radius is done on this Model 4 Bender. Tooling illustrates use of compound die for clamping on bent section.



FLAT STEEL BARS—Three ⅜" x 1" bars are bent in one operation to 160° on this Model 1 Bender. A split die actuator opens the dies for easy removal of the pieces. Bends are smooth and wrinkle-free.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

662 WALNUT • AURORA, ILLINOIS

WRITE FOR FREE CASE STUDIES

For news about rotary and press-type machines, tooling, etc., write for copies of PINES NEWS. Catalog also available.

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

Machining

WALTER K. BAILEY
President
Warner & Swasey Co.
Cleveland

ROBERT W. HANCOCK
President
Hancock Industries Inc.
Jackson, Mich.

M. R. ANDERSON
President
Michigan Tool Co.
Detroit

W. W. GILBERT
Manager, Machining Dev. Service
General Electric Co.
Schenectady, N. Y.

alloys, it must also be recognized that the difficulties encountered will provide more stimulus for the development of chipless production methods, such as roll forming, precision welding, casting, forging, and extrusion.

The development of new tool material types, a long range program, will have an important bearing on our machine tools.

A breakthrough may take many years and will require combined forces of research on a broad front in industry, universities, and private laboratories.

Increasing the machinability of the workpiece will continue to receive attention. Sound economical benefits will result from the use of free machining classes of materials.

Short Lot Efficiency Is Top Machining Trend

Walter K. Bailey—This year will see acceleration of the trend toward bringing the advantages of automatic cycling machine tools into smaller and smaller lot sizes to make job lot manufacture more automatic.

The most discussed and most publicized method of bringing automatic cycling to small lot production is through the medium of numerical controls, but it is not the only advance along these lines. Because of better mechanical and electrical components, automatic machines have been becoming increasingly more versatile. As an example, single spindle automatic turning machines have cut deeply into the hand operated, turret lathe market. Hand operated machines themselves have taken on more and more automatic features, such as automatic speed and feed changes, so that less of an operator's effort and control are required.

The new technologies in machine control have brought one new problem to all of us—that of reorienting our shop and industrial engineering organizations for their correct use. Training people to accept and properly utilize numerical controls, for instance, could be more of a problem than the technological difficulties with the controls themselves.

Tighter Production Control To Be Big Cost Cutter

Robert W. Hancock—Accelerated industrial output in 1960 will stimulate a faster than normal rise in the expansion of productive capacity—largely through better use of present facilities with new type cost-cutting equipment.

Mechanization is certainly the principal and most direct source of productivity gains, but in a less obvious way, greater efficiencies and better control of unproductive areas in manufacturing can mean more in output. The high manufacturing efficiencies that have been achieved through better production control slash unproductive labor costs and greatly improve competitive position. This year will see a great deal of management activity in the area of production control, inventory control, and production-data processing.

Progress in Gearmaking Helps Cost, Design Factors

M. R. Anderson—The next year or so will see major modifications and advances in the gear field.

Abrasive finishing (using plastic tools impregnated with grit) can improve gear quality. Nicks and burrs resulting from handling after shaving have been more troublesome than many people have realized.

Harder gear materials may give impetus to gear grinding as a production method. Present efforts to apply electrolytic grinding also show promise.

Automation is still in its infancy in gear manufacturing. We need even better methods of handling gears in process and automatic inspection devices to eliminate the human element and achieve better and more uniform gear quality. The development of better and more automatic inspection equipment could also measurably increase the load carrying capacity of gears—significantly affecting the design of mechanical drives in general.

The introduction of gear tooth forming gave major impetus to the search for efficient ways of producing accurate parts without machining.

Challenge of New Alloys Portends Machining Advance

W. W. Gilbert—Numerical programed machine tools will provide a major breakthrough in reducing the costs for low production. Tape controlled machines require that the programer specify every motion and every tool used in the machining process. The programer can take full advantage of all machinability data to keep operations in the minimum cost and maximum production ranges. Computerized programing will soon eliminate much of the computation and needless repetition of manual programing.

Since the cutting tools for programed machines must be quick change and preset, there is need for further developments in tools or toolholders to compensate for wear and deflection. Development of gaging tools which will automatically inspect

(*Please turn to Page* 270)

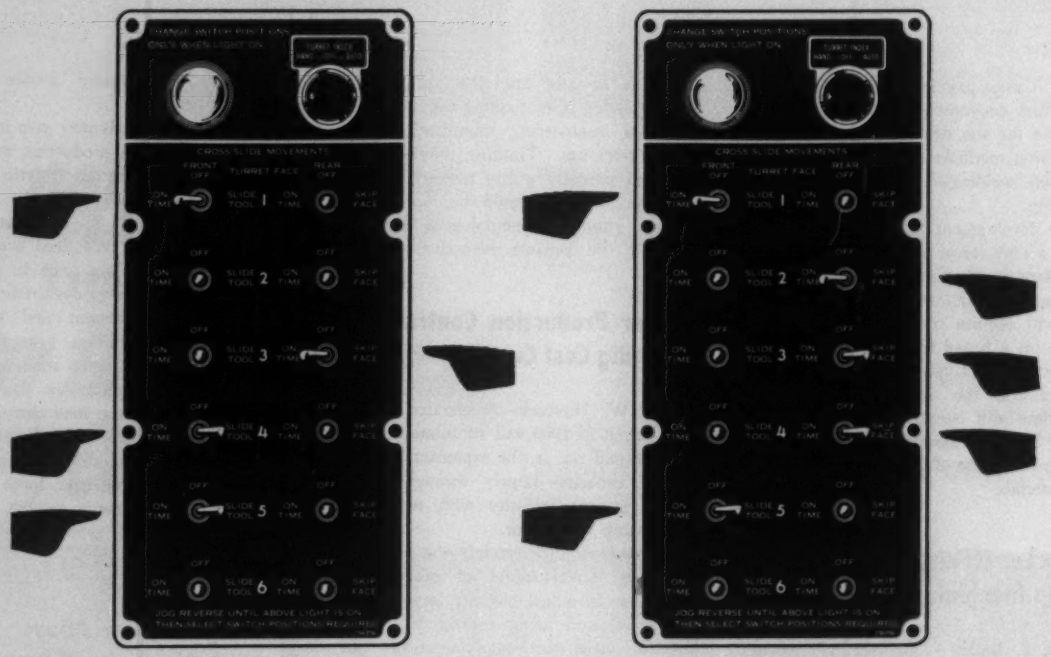
P&J means Profitable Jobs...

...RE-EQUIP WITH A

AN ALL-NEW MACHINE . . . WITH ALL THE

NEW SELECTOR SWITCH CROSS SLIDE CONTROL

This new control system lets you set all cross slide movements by merely operating selector switches. There are no covers to remove or replace, no pins or rolls to relocate. Setup is much faster and easier . . . programming is much more flexible. Front and back slides can be set for on-time or delayed motion relative to the turret movement—without *any* restriction to the sequence pattern. Both slides can be operated together or independently with any turret face and can be adjusted longitudinally, independent of each other.



TURRET FACE No. 1—Front Cross Slide operates *on time* relative to the turret motion.
TURRET FACE No. 3—Rear Cross Slide operates *on time* relative to the turret motion.
TURRET FACE No. 4—Front Cross Slide is *delayed* relative to the turret motion, for slide tool operation.
TURRET FACE No. 5—Front Cross Slide is *delayed* relative to the turret motion, for slide tool operation.

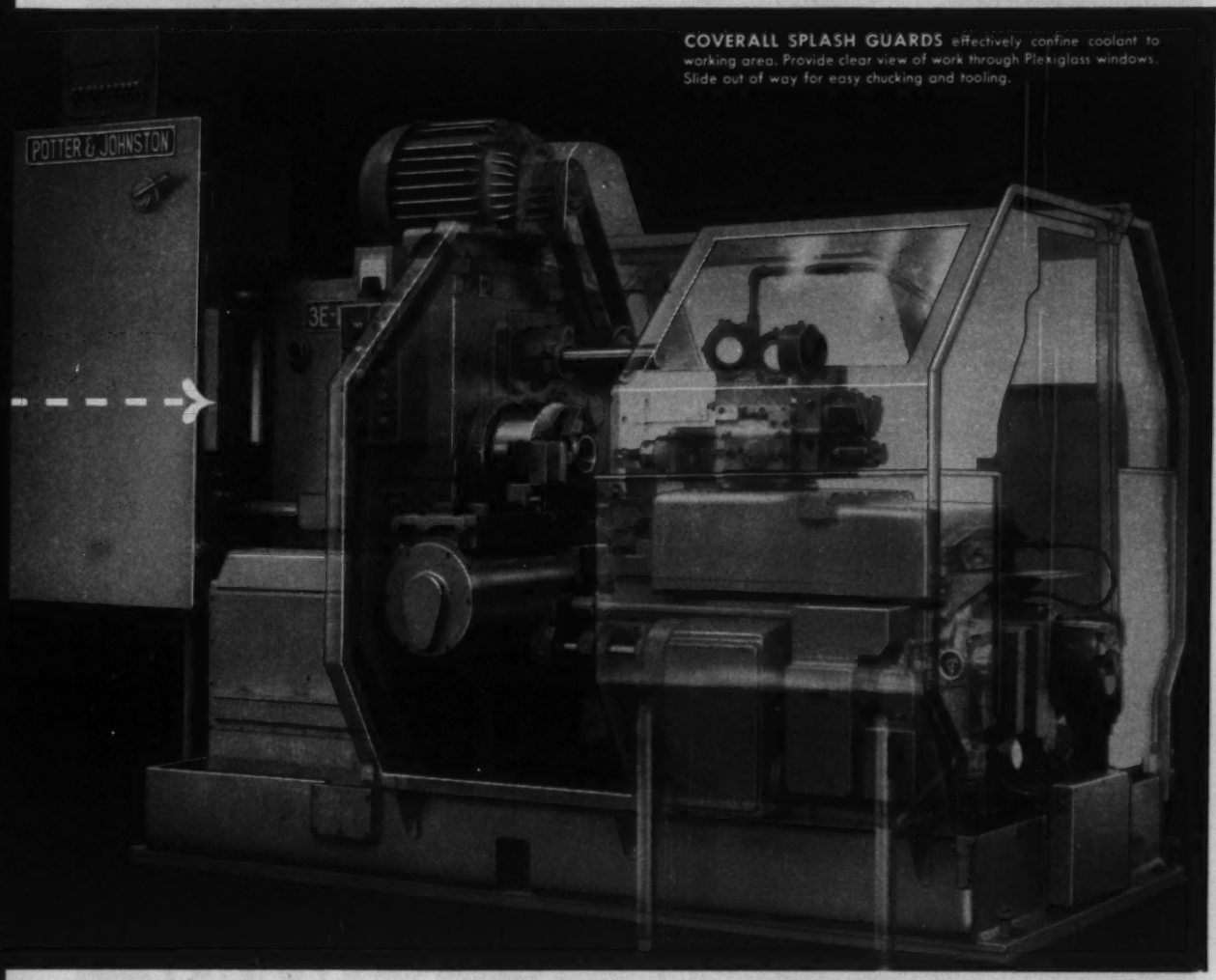
TURRET FACE No. 1—Front Cross Slide operates *on time* relative to the turret motion.
TURRET FACE No. 2—Rear Cross Slide operates *on time* relative to the turret motion.
TURRET FACE No. 3—Skip turret face.
TURRET FACE No. 4—Skip turret face
TURRET FACE No. 5—Front Cross Slide is *delayed* relative to the turret motion, for slide tool operation.

OPTIONAL TAPE CONTROL

Simple in design, easy to understand and operate, and priced far below other systems, P&J Tape Control can save up to 25% in machining and setup time. Tape controls all movements of the spindle, turret and cross slides, including all speed and feed changes. Tape preparation for the average job takes less than 30 minutes and requires no technical knowledge. Programming setup time is eliminated by placing the tape in the machine's tape reader—which only takes a couple of minutes. Optimum programming is assured, with parts machined in minimum time.

3E-15 Automatic

ADVANCED-DESIGN FEATURES YOU'RE LOOKING FOR!



COVERALL SPLASH GUARDS effectively confine coolant to working area. Provide clear view of work through Plexiglass windows. Slide out of way for easy chucking and tooling.

The Potter & Johnston 3E-15 Automatic Turret Lathe is a truly new machine from the base up—*not* just an old model with a "face-lifting!" In addition to Selector Switch Cross Slide Control and Optional Tape Control, this machine also offers many other important new design and construction features, including: A new 15 hp headstock, with power to spare for fast metal removal with carbide tooling; greater rigidity throughout for faster roughing and more accurate finishing; "Control Zone" operation for faster, easier, more convenient setup and machining; separate drive for turret indexing for faster, easier setup; self-adjusting electric clutches that never require maintenance; a central, automatic lube system with single point fill; and a 6-face turret that allows more cuts per automatic machining cycle.

ON-THE-JOB PERFORMANCE . . . has already proved the ability of the P&J 3E-15 to cut machining time and costs. For a complete description of all the 3E-15 features, send now for your free copy of Circular No. 177 Pratt & Whitney Company, Inc., *13* Charter Oak Boulevard, West Hartford, Connecticut.

100th Anniversary 1860 1960

PRATT & WHITNEY®

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

Machining

ALAN C. MATTISON
President
Mattison Machine Works
Rockford, Ill.

ARVID O. LUNDELL
President
Colonial Broach & Machine Co.
Detroit

HOWARD N. MAYNARD
President
Snyder Corp.
Detroit

WALTER S. PRAEG
President
National Broach & Machine Co.
Detroit

(*Concluded from Page 267*)

the part and feed back information to adjust the tool also is desired.

New alloys used to resist heat in jet engines have made it necessary to reduce the cutting speeds to values typical of those used 50 years ago. The decrease in production necessitates development of new methods for machining these alloys. Ceramic tools have offered only a limited promise since they lack ductility and high strength.

Electrochemical machining offers considerable promise. Rapid strides are being made in both spark machining and electrolytic metal removal. Rates of cutting have recently been increased up to ten times by proper selection of electrode composition, chemical analysis of the fluid, and current density.

New Grinding Machines To Aid Variety of Jobs

Alan C. Mattison—Wide belt, abrasive belt grinding and polishing machines are proving their versatility on new applications. The aircraft industry uses them for close tolerance finishing of stainless sheet stock and honeycombs. An unusual development in machining of honeycombs: Filling the combs with beeswax at the leading and trailing edges to improve rigidity under the grinding cut.

Electrolytic grinding should also gain acceptance in 1960. Big, vertical spindle rotaries, with electrolytic attachments to grind carbide cutter blades on a continuous feed basis, avoid the high costs of batch loading and multiple pass stock removal. They reduce wheel cost and scrap losses by as much as 80 per cent.

Fully automated straight-through grinders will open up new cost saving opportunities. Such a machine recently went into full production in a leading farm machinery plant, doubling production while maintaining accuracies well within the close limits required. Automatic gaging and wheel wear compensation, with recirculating pallets for holding the workpiece, are design features which make this processing applicable to many products.

Broaching Is Teamed Up With Transfer Machines

Arvid O. Lundell—Because of growing production demands, the broaching industry must be on the alert to keep pace through development of machines, fixtures, and tooling to integrate broaching equipment with related machines, such as drilling and reaming, as much as possible.

One of the outstanding developments in broaching is its adaptation to transfer type machines and similar multiple operation automatic equipment. For example, one important producer of adjustable wrenches is using a transfer machine in the manufacture of a complete line of four sizes, all on the same machine. Combined on the machine are such operations as drilling, reaming, end milling, tapping and, above all, numerous surface and internal broaching operations.

Transfer Machine Builders Will Strive for Quality Highs

Howard N. Maynard—Now that builders of special machines are facing their perennial problem of meeting delivery promises, industry can help by finalizing design and processing procedures where possible before the machine tool estimate stage is reached.

Buyers of special machines are asking for about the same equipment designs as they were specifying early in 1959. They are exceedingly conscious of cost savings possible with new equipment. They are still emphasizing the reworking of existing equipment wherever possible. They are also most conscious of quality and workmanship considerations which were lacking in some equipment delivered during the deepest recession period.

The ability to rebuild transfer type machine tools was dramatically proved in many of the compact car programs. The building block trend in machine design as well as the trend toward any devices that will decrease machine downtime is continuing.

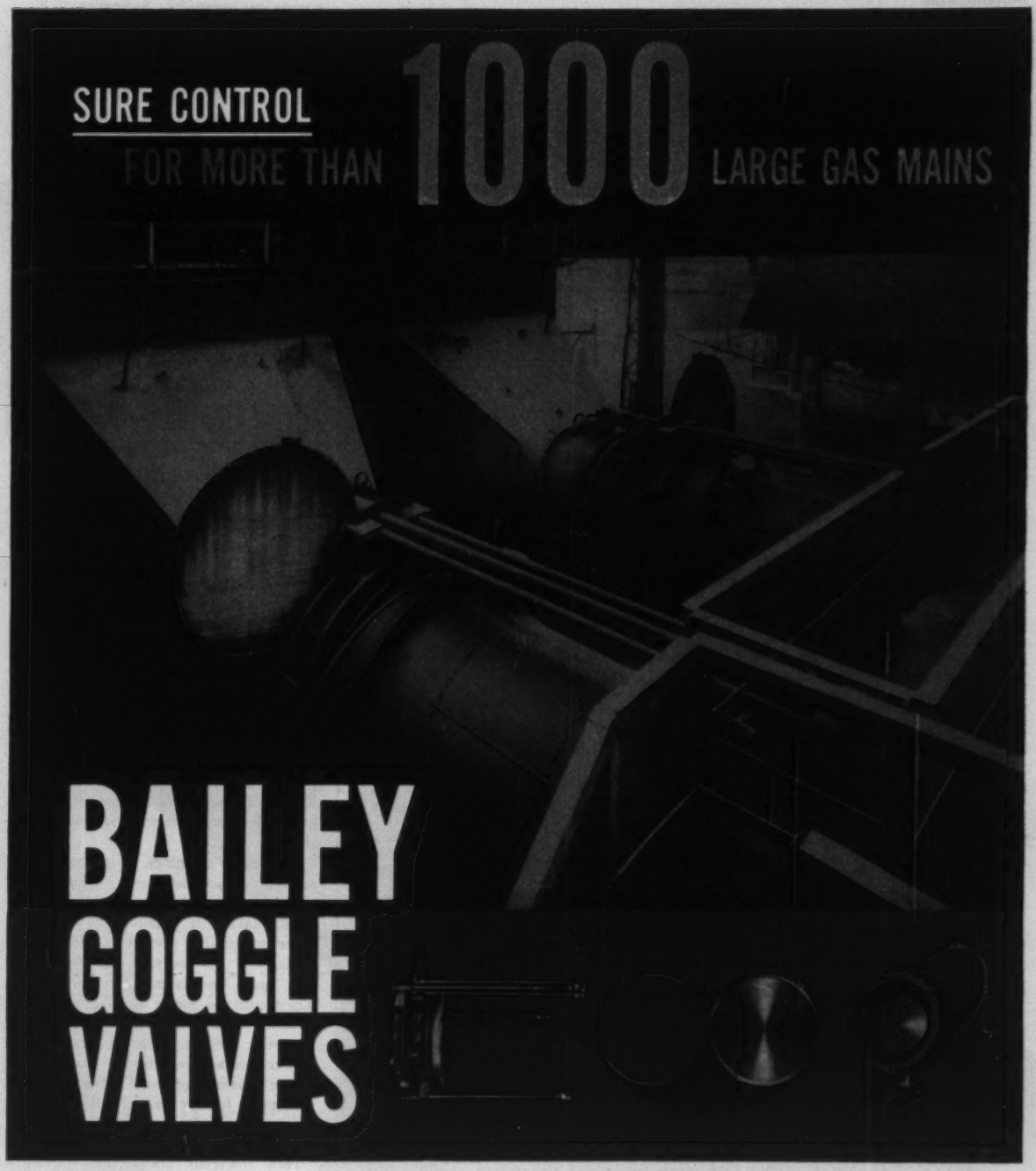
Gear Honing, Tooth Broaching Share in Bright Outlook

Walter S. Praeg—New, compact designs of gear honing machines will be put on the market in 1960. A wide variety of honing methods in one machine to suit different hardened gear requirements will be offered.

There is a renewed demand by some volume gear producers for new equipment that will quickly give a 100 per cent check on every gear produced. Until now, automatic gaging has been utilized to check one or two variables, such as size or helix angle variation. Such other variables as eccentricity, spacing, and involute profile have been checked individually on separate nonproduction type equipment.

It is possible to check every feature of every produced gear on production line type inspection equipment. Such equipment is, of course, expensive to engineer, develop and build. However, the savings made possible will more than justify the investment.

One of the most economical methods of



Thermal Expansion Goggle Valve . . . Goggle Plate . . . Mechanical Goggle Valve

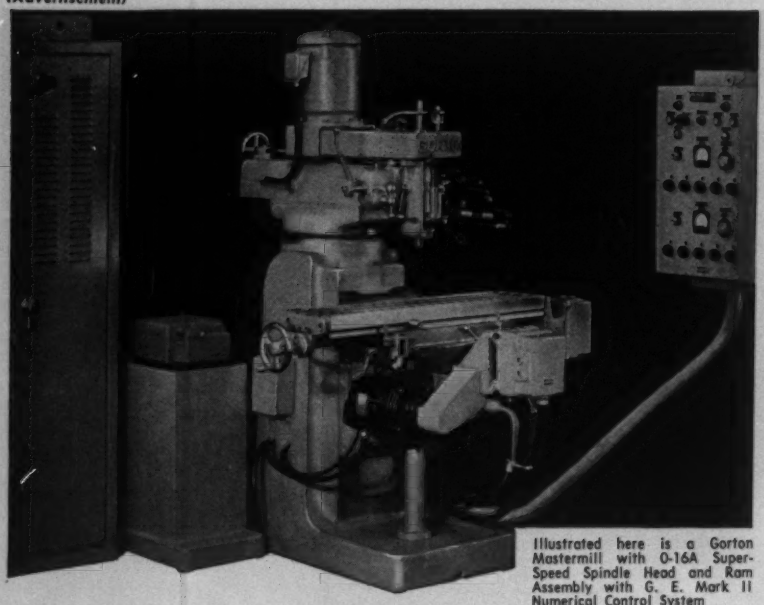
Widely used on blast furnaces, gas washers, precipitators and boiler plants, Bailey Goggle Valves assure safety and efficient service—regardless of the time they may remain unused.

These valves are made in two types: *Thermal Expansion*, which utilizes the linear expansion and contraction of steel for sealing and freeing the goggle plate (for 48" to 120" lines); *Mechanical*, on which a powerful clamping force is applied at all points around the disc periphery (for 6" to 72" lines).

• *Write for Bulletin.*

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA

(Advertisement)



Illustrated here is a Gorton Mastermill with 0-16A Super-Speed Spindle Head and Ram Assembly with G. E. Mark II Numerical Control System

Numerical Control Cuts Short-Run Milling Costs

Requirements of the machining problem determine the type of control

One of the truly fascinating aspects of numerical control is the way in which it changes the "impossible" into the possible . . . usually at a high profit. For instance; remarkable savings have been obtained in the production of "headache" parts, in ability to machine "out of reach" work areas, in maintenance of uniform tolerances on complicated interchangeable components, and in the elimination of waste, rejects, and high inspection costs.

Numerical control is especially suitable wherever design of parts is beyond manual control or multi-tooling capabilities, or where parts are too small to see or too large to comprehend. It is ideal when flexibility is required throughout the entire operation, or when machining requires continuous inspection.

Selecting the right control is the key to profitable operation. The control should be custom-fitted to the machine. This is particularly important in short-run applications because it is here that the greatest economies are obtainable.

The photo above illustrates a Gorton Mastermill Model 1-22 which is "custom-tailored" to numerical control for short runs . . . with built-in transverse and longitudinal table movements and vertical spindle travel. Positioning information increment can be as low as .001 with cycling up to 20 per minute. This machine, if suitable to your requirements, can bring you remarkable production economies.

Further and complete information may be obtained on letterhead request to George Gorton Machine Co., 2001 Racine St., Racine, Wis.

Machining

R. D. HALVERSTADT
Manager, Thomson Laboratory
General Electric Co.
West Lynn, Mass.

producing the teeth on steel or cast iron external spur on helical gears is to broach them in one pass on a hydraulic press. The broaching tool is a one piece hollow broach that operates in conjunction with a lead bar for helical gear production.

Automation and Design Can Curb Rising Costs

R. D. Halverstadt—The rising costs of civilian goods manufacturing will be met by a full swing to flexible automation and added emphasis on producibility design.

The new machines must be flexible enough so product design changes can be made with only minor tooling change costs, making it possible for each machine to outlive several product design evolutions. To use such machines, products must be designed for automation. They must be made up of simple components which can be easily produced. As usual, product designers have the key to our competitive future in their hands.

The Space Age cost barrier will be penetrated by our best efforts in flexible automation and by the application of many new materials and processes.

New materials are increasingly difficult to machine. Those that have potential in the immediate future are in the 400,000 psi range.

Present tools are entirely inadequate to machine the new high strength and high temperature alloys. A major development effort on cutting tool materials during the next several years will probably produce a whole new family of dependable tools. They will have the temperature-hardness characteristics of some of our sintered carbides and the impact resistance similar to that of high speed tool steel.

are you selling technical management?

Somewhere along the line, the technical manager will use his fund of knowledge to pass judgment upon your product, or a competing product, to solve the metalworking problem that is his responsibility. He's important – this technical man who is president, plant manager, materials or metallurgical engineer – because it is his job to *care what happens to metals.* We call him the "metals engineer," and there is but one publication that speaks directly, exclusively, to him. That publication is Metal Progress, the monthly engineering magazine of his society, the American Society for Metals.

Covering the engineering aspects of metals, Metal Progress finds your man, the one you're missing, and puts him into a receptive frame of mind where your advertising can help him solve another problem. This is why it is so important to consider Metal Progress a vital part of your *complete* advertising program.

Metal Progress

Published by The American Society for Metals

METALS ENGINEERS AT WORK
L/R: D. J. Cash, Process Engineer, and H. F. Jordan, Jr., Chief Administrative Engineer— The Cleveland Pneumatic Tool Co.

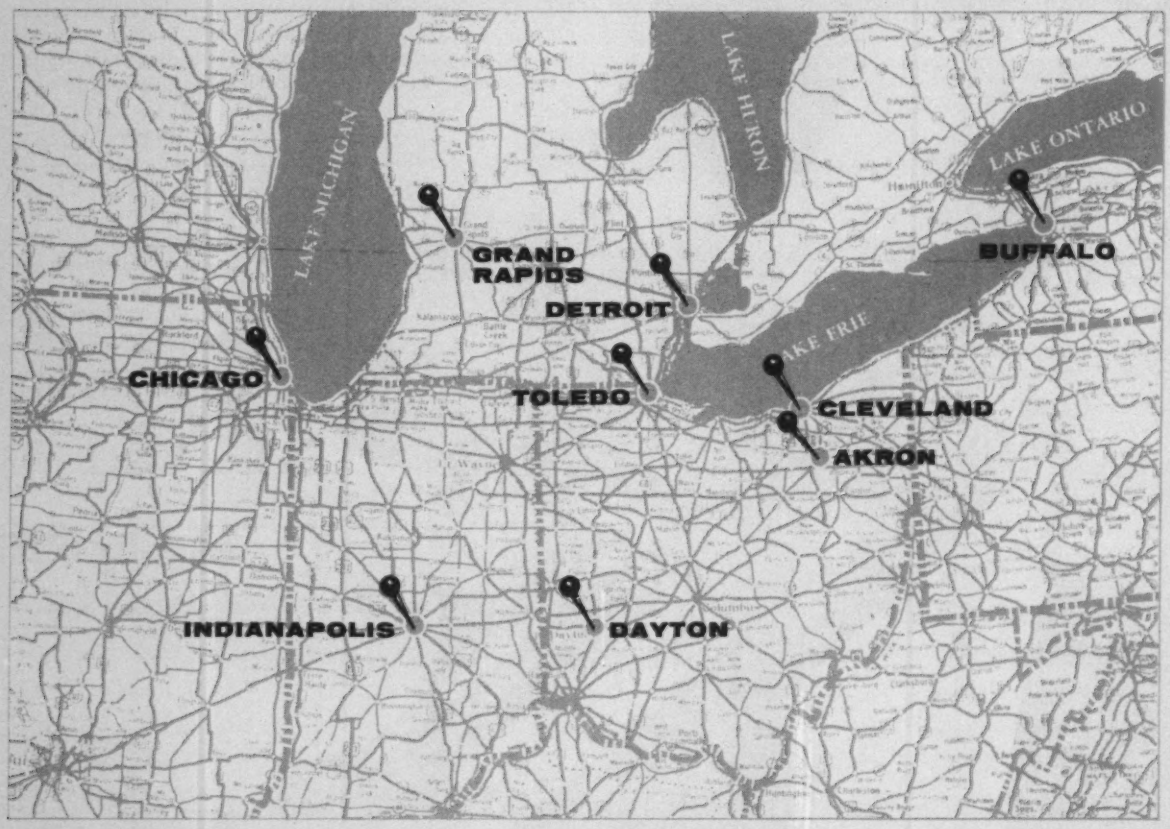
when in Cleveland, visit our new headquarters . . .

METALS PARK • NOVELTY, OHIO

Other ASM Activities: METALS REVIEW • METAL SHOWS • METALS ENGINEERING INSTITUTE • METALS HANDBOOK • TRANSACTIONS • TECHNICAL BOOKS

PENINSULAR'S Team of 9 Steel Service Centers working together to give you STEEL plus SERVICE

America's Largest Independent Tool Steel Distributor



TOOL STEELS • ALLOYS • COLD DRAWN • HOLLOBAR
FLAT GROUND STOCK • DRILL ROD • PLATE

Over 40 Years of Service to Industry

PENINSULAR STEEL COMPANY

24401 GROESBECK • P. O. BOX 3853 • DETROIT 5, MICHIGAN
DREXEL 1-9400 • PRESCOTT 8-2121

DETROIT • CLEVELAND • INDIANAPOLIS • TOLEDO • AKRON • DAYTON • CHICAGO • GRAND RAPIDS • BUFFALO

ARTHUR E. GILMAN
President
Bay State Abrasive Products Co.
Westboro, Mass.

LEIGHTON A. WILKIE
Chairman
DoAll Co.
Des Plaines, Ill.

W. B. KENNEDY
Chief, Experimental Machining Branch
Redman Laboratory, Watertown Arsenal
Watertown, Mass.

PHILIP M. McKENNA
President
Kennametal Inc.
Latrobe, Pa.

1960 FORUM ON TECHNICAL PROGRESS

Tooling and Gaging

More Automation, New Grain To Improve Grinding Wheels

Arthur E. Gilman—Manufacturers of bonded abrasive products have an ever present problem: Consumers demand precise duplication of grinding wheels from order to order. To meet such requirements, electronic computers are used to determine the amount of ingredients in grinding wheel formulas. The use of electronics has been extended to the selection and weighing of ingredients. Eventually, the technique will be applied to other manufacturing steps to eliminate all possibility of human error in the production of grinding wheels, and that day is not too far off.

Another development to be announced soon is a greatly improved aluminum oxide abrasive grain. The chemical composition of the grain will be similar to that of the present type, but the crystallization will be distinctly different. It will be particularly effective in heavy duty wheels used in the steel industry where higher speeds, greater pressures, and safer operation are being required. The grinding wheel industry is co-ordinating its efforts with the grinding machine manufacturers in this endeavor.

The abrasive industry is also continuing to work on manufacturing improvements to produce abrasive honing products that will produce more uniform and flawless surface finishes.

Band Machining Improves, Will Hike Productivity

Leighton A. Wilkie—Band machine and saw band development perfected for 1960 use are now available for practically all phases of manufacturing operations.

Basic machining cuts such as notching, slotting, beveling, recessing and refacing both straight and contour are further applications where band machining will warrant first consideration. The power feeding table on the machine which employs high speed steel saw bands boosts the productivity of the 1960 band machine.

Ceramic Tools Pay Off In Machining Hard Alloys

W. B. Kennedy—Today's alloys, especially those hard-to-machine materials, have seriously decreased cutting speeds and tool life—in many cases to prewar figures. The ceramic tool has come through in aiding the machining of hard alloys, some of which ranged from 40 to 60 Rockwell C. Machining of many other new alloys, however, is still at discouraging rates. Increasing demand for components of commercially pure metals, such as molybdenum and beryllium, adds to the increasing list of shop problems.

Today's ceramic tools are considered superior to their predecessors, and rough machining of gun tubes at Watervliet Arsenal proves that ceramics are not restricted to finishing. The gun tubes, a modified AISI 4340 alloy steel, are being machined at about 400 surface feet a minute with a $\frac{3}{8}$ in. depth of cut.

Although ceramic tool applications are steadily increasing, there is still need for a ceramic or cermet capable of offering a higher resistance to impact. Such a tool would provide many applications for milling machines. There is also a need for a cheaper ceramic tool.

Short Tool Life Concept Advances Cutting Efficiency

Philip M. McKenna—Although tool costs have been increased many times by pushing tools harder and faster, machining

Tooling and Gaging

HARRY E. CONRAD
Executive Secretary
American Society of Tool Engineers
Detroit

FREDERICK S. BLOCH
President
Eldorado Tool & Mfg. Corp.
Milford, Conn.

FREDERICK S. BLACKALL JR.
President & Treasurer
Taft-Peirce Mfg. Co.
Woonsocket, R. I.

W. M. WHEILDON
Research & Development Dept.
Norton Co.
Worcester, Mass.

cost per piece can be reduced as much as 75 per cent. The concept is encouraging more liberal use of tungsten hard carbide alloys and mechanically held, throwaway inserts. The trend will be accelerated as the productivity-cost situation becomes more critical in competing with an industrially revived Europe.

Another factor helping to broaden the utilization of tungsten carbide alloys is the availability of ample supplies of tungsten at prices that encourage design engineers to use the alloys as elements of construction. The carbides offer unique characteristics. An example is a rigidity three times that of steel, an especially desirable characteristic in products like boring bars and grinding quills for precision machining. One example was the development of a boring bar over 65 in. long and weighing more than 400 lb to contour bore chambers 40 in. deep in artillery components. Use of the bar cut machining time to less than half. Potential savings for 1000 units are estimated at more than $145,000.

We Need More Research To Maintain Our Pace

Harry E. Conrad—Optical tooling is moving out of aircraft to other industries. Plastic tooling continues to be used increasingly. Fixturing of more complex design, higher precision, and greater automation will meet the urgent need for savings in machine time and attendance. Preset tooling, especially in conjunction with disposable carbide or oxide tips, is gaining rapidly.

To maintain progress, we need much more research, both basic and applied. Scientific findings have to be understood and assimilated before tool and manufacturing engineers can apply them. They want clear answers to such questions as:

"How does plasma arc work, so we can control and direct it better?"

"What happens when an explosion socks metal into a die cavity?"

"What causes strains in processed parts?"

New Tool Materials May Aid Gun Drilling

Frederick S. Bloch—Gun drills as small as 0.078 in. will be available this year. They will drill holes from solid material to ±0.0003 in. tolerance, to any reasonable depth, in one pass, in production.

Further progress will be made in the search for new and improved cutting tool materials. Cermets will be tried where carbides leave off. The development will take at least three years. Hardnesses of 56 Rockwell C may be machinable then.

Our new materials, such as columbium and molybdenum base alloys, will then be economical to machine.

The biggest improvement we can make in the next two years is to bring technical information to all personnel concerned. You cannot take economical advantage of a method or process that your men do not know about.

Optimum Gaging Needed To Meet Closer Tolerances

Frederick S. Blackall Jr.—Much military hardware requires tolerances that represent laboratory accuracy. The trend is also evident in many industrial products. Maintenance of such standards merits the most thoughtful consideration of quality in gaging equipment.

A broad understanding on the part of the gage manufacturer of all major gaging techniques (fixed air, electronic, and mechanical gaging devices and fixtures) is essential if optimum efficiency is to be achieved in the user's plant. Great strides have been made in the application of newer forms of instrument gaging on both standard and special automatic machines, where parts require checking and sorting to extremely close tolerances. Inspection has moved from the bench to the machine, with capsule sensing elements which simplify pickup.

Gage procurement is one area subject to penny wisdom and pound foolishness.

Emphasis on high precision has brought about increased attention to the importance of the geometry and surface finish of fine parts. Recent developments have made possible superfine finishes, not readily attainable before, coupled with correction of the geometry.

Ceramics Solve Problem Jobs But Need More Strength

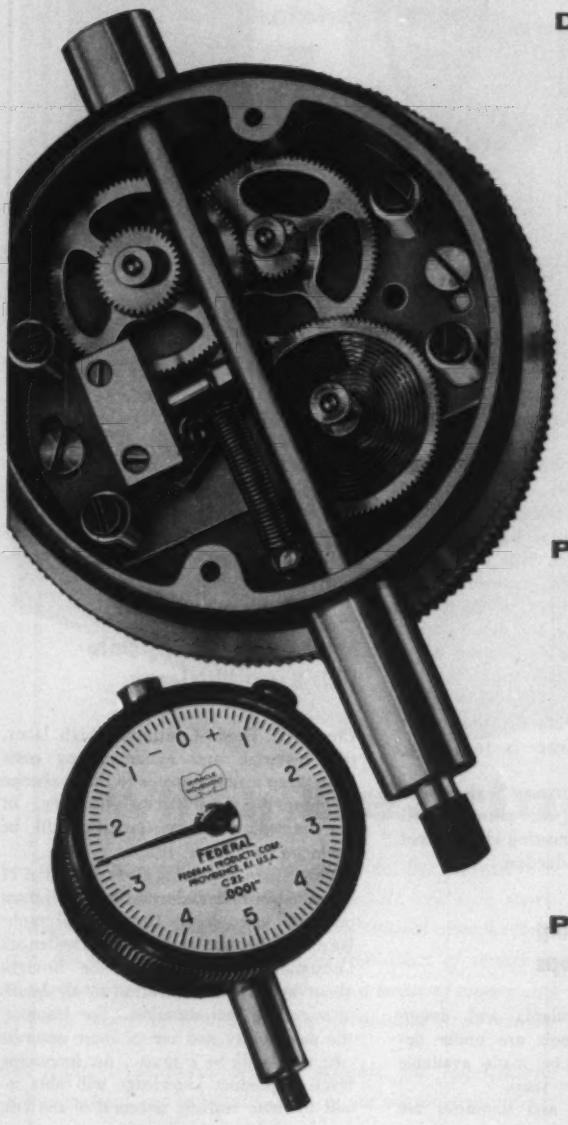
W. M. Whieldon—Ceramic cutting tools are rough turning gun barrels of AISI 4340 (38 to 42 Rockwell C) at about double the previous rate. The automotive industry has applied ceramic tooling to cast iron finishing on parts like automatic transmission brake drums with increased cycling rates and better tool life.

Refinishing of hardened steel rolls in the 60 to 62 Rockwell C range is being done with a satisfactory finish in a fraction of the time required for grinding. In addition, ceramic tools are holding closer size on long turning jobs.

Ceramics still have a low resistance to impact. While gains have been made, substantial improvement is required and can be expected in the next few years.

It has become increasingly evident that

TRUSTWORTHY



DESIGN . . . At Federal, good design is an attainment to be improved upon. Regular precision bearings are good, but Federal introduced *jeweled* bearings which are virtually frictionless and retain their precision longer. A movement integral with the Indicator case is good, but Federal devised the Unit Movement which permits much greater assembly accuracy. The conventional indicating hand is good, but Federal's *dynamically balanced* hand reduces inertia and puts less stress on the movement. And so on . . . through Cushion Movement, Hardened Gears, Wetproofing and finally the greatest improvement yet — the Federal Miracle Movement, an operating unit so wear-resistant and shock-resistant you will probably never need to repair or replace it! All these improvements appeared *first* in Federal Indicators . . . and only after they had been proven thoroughly practical — your guarantee of obtaining the best.

PERFORMANCE . . . ALL Dial Indicators must meet established standards. Federal Dial Indicators must EXCEED them. Closer tolerances at critical points . . . extra steps in production . . . more critical inspection . . . all contribute to the highest quality. In short, better habits of production provide that margin of excellence beyond mere acceptance. True confidence begins with that margin wherein lies the extra accuracy . . . strength . . . dependability needed to fulfill the severe, as well as the ordinary requirement . . . without question. This is why more Federal Dial Indicators are used than all others combined.

PRICE . . . We do not offer a premium price as proof of excellence. We wouldn't because it is not proof. *We can't* because Federal Dial Indicators are generally *lower* in price than competitive makes. Lower than standard prices for a better product are only possible through the large volume demand generated by industry's wide *preference* and the economies of manufacturing efficiency. The sum total significance to you is . . . Federal Dial Indicators are a better investment.

For complete story on Miracle Movement, write Federal Products Corporation.

FEDERAL PRODUCTS CORPORATION
9211 Eddy Street • • Providence 1, R. I.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Tooling & Gaging

R. W. RUCKEL
President
Wesson Co.
Detroit

H. J. BALES
Chief, Tool Design
Boeing Airplane Co.
Wichita, Kans.

JOHN DELMONTE
General Manager
Furane Plastics Inc.
Los Angeles

CHARLES E. REED
General Manager
Metallurgical Products Dept.,
General Electric Co., Detroit

attention must be paid to tool geometry and toolholders. A cutting edge land or flat about one-half to two-thirds the width of the feed at about 60 degrees to the top tool surface strengthens the leading edge of the tool and allows it to take much more punishment when cutting alloy steels.

Cutting Tool Goal: Low Machining Costs

R. W. Ruckel—We are entering a new era in the metalworking industry. Since our country is faced with an unfavorable trade balance for the first time in 100 years, and since tariff protection is not the answer, we are confronted with serious problems. We propose to attack these problems in 1960 by:

1. Increasing research expenditures from 3 per cent to 6 per cent of sales.
2. Obtaining more realistic rate evaluation for certain classifications in shop jobs.
3. Proceeding with further mechanization of manufacturing operations including the use of tape controlled machines. Products which result in lower machining costs per piece and not necessarily low initial costs will be the objective.

Cost of Aircraft Tooling Will Be Prime Target

H. J. Bales—Aircraft tooling must be changed radically to reduce costs. Methods of getting economy in tool design, tool fabrication, and the selection and use of tooling materials require concentrated effort.

One approach to tooling economy has been the documentation of a minimum tooling philosophy. It created an awareness of the relationship between tooling cost and unit product cost. The combined experience of tool engineers and toolmakers has been used to develop checklists for reducing tooling cost without increasing product cost. Increased development of such specialized information for distribution to junior engineers and other tooling employees will be an effective weapon for cost reduction.

Much thought has been given to reducing engineering data and design formulas to computer data to produce engineering drawings through translation of the input data alone. The use of computers by manufacturing for production and tooling requirements is in its infancy.

Ultimately, computers may be developed to the extent they will eliminate all steps between the engineering idea concept and the hardware production.

New Plastic Tooling To Help Small Shops

John Delmonte—Standards and design criteria for plastic tools are under development and will be made available during the next few years.

Sheet metal shops and foundries are using plastic tooling to a greater degree than had been anticipated.

Steel-filled mass casting resins introduced a few years ago will be joined by aluminum filled equivalents. Mass casting resins permit plastic tools to be poured without gel coatings and laminating. The technique will do much to spur acceptance by small shops concerned with a minimum of operations.

Flexible silicone resins for higher temperature operations will begin their entry into metalworking. Too expensive for large tools, they should find applications in the fabrication of small parts. The silicone formulations have demonstrated room temperature curing qualities and adaptability to temperatures up to 500° F.

The adhesive qualities of epoxies will encourage their acceptance in some jobs as replacements for mechanical fasteners. We are observing an increasing number of metal fabricators utilizing our epoxy products for bonding and assembly purposes.

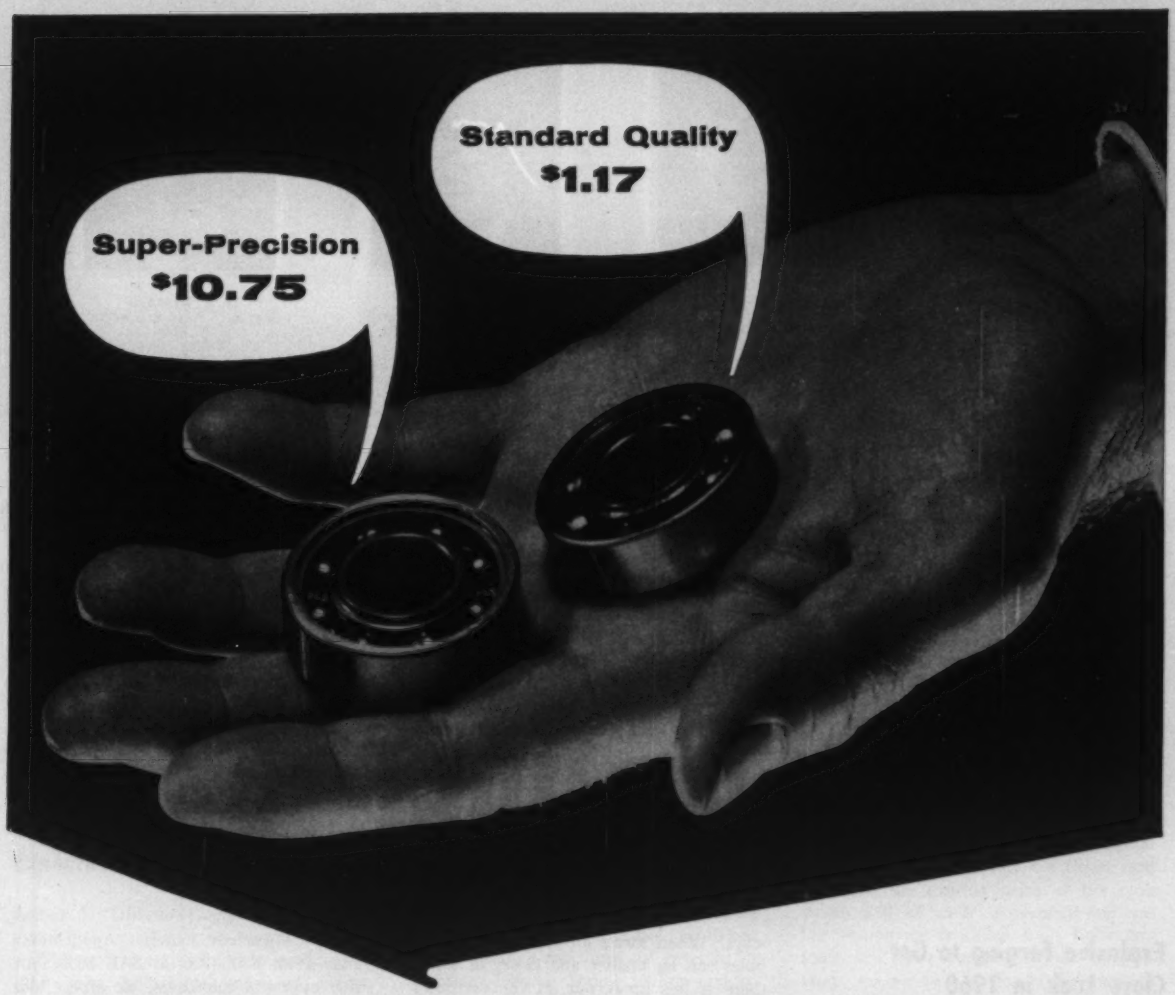
More Machinability Data Will Boost Efficiency

Charles E. Reed—Continuing high labor, raw material, and manufacturing costs have given a new impetus to the challenge of improving metalworking efficiency. In the immediate future, progress will be made on two broad fronts.

Progress in upgrading the application of cemented carbide and oxide tools will most certainly take place. Cutting tool problems will become cutting tool challenges. Outstanding solutions will be brought about by increased attention to all details of a cutting tool situation. For instance, the availability and use of more accurate cost data will be a must. An increasing level of product knowledge will also result in more realistic selection of the best tool materials.

Hi-E (High Efficiency) machining will surely become an important tool. Applying the Hi-E principles will give a range of cutting speeds bounded on one side by the cutting speed at which minimum cost occurs and on the other side by the speed at which the maximum production rate occurs. The optimum cutting speed will be found within this range.

Innovations in both tools and tool materials will continue to be an important spur to metalworking efficiency. A new series of product improvements will be coming at an accelerated pace.



Which Bearing should you buy?

—They're dimensionally interchangeable, but dimension is only one of many factors to consider. At left, is a super-precision bearing, made to the most critical specifications and good for thousands of trouble-free hours of service in the proper application. This bearing is a waste of money and often a source of trouble in less demanding applications.

At right, a standard bearing suitable for applications where preload, run-out and tolerances are not too demanding.

Which should you buy? Let our bearing engineers help you. When you buy super-precision from Bearings, Inc., you get super-precision bearings in the manufacturers' original boxes — factory-fresh and incorporating the latest improvements. They are usually carried in stock and delivery is immediate.

If a standard bearing is best, you will get it fast from Bearings, Inc. And above all, when your Receiving Department checks the bearings received against your purchase order, you'll find you have received what you have ordered—exactly with no "just as good" substitutions!

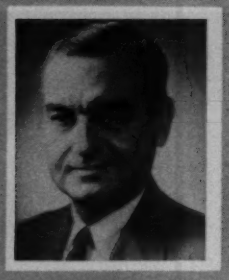
Call the Bearings, Inc. branch nearest you NOW!

Providing bearing service in the North ➤ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Painesville • Toledo • Youngstown Zanesville • **INDIANA:** Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York **WEST VIRGINIA:** Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden **NEW YORK:** Belanrol Corp., Buffalo • Niagara Falls • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans **N. CAROLINA:** Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville **VIRGINIA:** Norfolk • Richmond



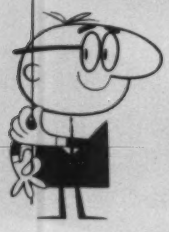
A. O. SCHAEFER
President
Pencoyd Steel & Forge Corp.
Philadelphia

CARTER C. HIGGINS
President
Worcester Pressed Steel Co.
Worcester, Mass.

MELVIN D. VERSON
Vice President, Administration
Verson Allsteel Press Co.
Chicago

J. K. WINGARD
Manager, Press Engineering
E. W. Bliss Co.
Canton, Ohio

1960 FORUM ON TECHNICAL PROGRESS



Forming

Explosive Forging to Get Close Look in 1960

A. O. Schaefer—The steel forging industry is participating in rather extensive changes.

Explosive forging has been growing. During the coming year, we may get a fair appraisal of its potential.

All forgings, particularly large ones, are essentially processed ingots. Their quality, dimensions, solidity, and particularly segregation pattern, are of major importance.

Vacuum melting and pouring improve the ingot. Their usefulness will expand.

It is possible that such processes are not the ultimate. The search continues.

Most steel forgings are for durable goods, so our business may lag slightly behind any major business change. Lack of supplies for a long period may have produced shortages which could improve that outlook.

"Stacking" Method to Get Close Look by Stampers

Carter C. Higgins—We look for substantial interest in "stacked" stampings because they are economical in so many ways. When sheets are fastened together, holes can be smaller and closer to edges; there is less break out on the periphery than in heavy gage materials. Gear teeth, internal passages, and varying hole depths are possible.

The principal problems: Gaps at the edge between layers; methods of attaching layers (it seems likely that adhesives may solve that); and the effect of cumulative tolerances for each layer of material. Layers must sometimes be belt sanded flat prior to brazing large parts.

Stampers will be affected by new equipment like the new vertical multislides, so-called "vertical progression" methods of tooling, new standard automation devices of fairly wide application, and ultrasonic tumbling.

Foresees Impact Machining Of Tool Steels, Exotic Metals

Melvin D. Verson—More than ever, industry is taking a closer look at chipless production. Increased interest in impact machining has developed and switches from conventional methods have brought substantial savings, often as much as 98 per cent. The process often enables you to use a lower cost material. Applications range from SAE-1006 to SAE 8630, but with improved lubricants, we expect tool steels and the exotic metals can be used. Auto and appliance people will take more advantage of the method.

One piece and complex designs will require heavier press equipment, so capacities will become greater with more complex tooling. Many metal products are produced in multiple station presses. Deep draws, cam piercing, and extrusion in combination with other operations are done on more large, heavy, nonsymmetrical shapes.

New Press Will Turn Out Powder Metal Parts Faster

J. K. Wingard—Progress in forming and press design must be separated into two segments.

In forming complex shapes from ultra-high-strength metals, we expect developments in high velocity forming via explosives, high voltage shock, pneumatic shock, and other means. It is unlikely that such methods will apply to conventional production.

In the regular mass production, progress

ARTHUR E. UHLEEN
Executive Vice President, EnamelStrip Corp., Subsidiary of National Steel Corp. Pittsburgh

J. E. HAWKING
Sales Manager
Pines Engineering Co. Inc.
Aurora, Ill.

PRESTON L. HILL
Colonel, USAF, Chief, Mfg. Methods
AMC Aeronautical Systems Center
Wright-Patterson Air Force Base, Ohio

J. W. NICHOLAS
Group Engineer, Producibility
Lockheed Aircraft Corp.
Burbank, Calif.

will be via improvement and expansion rather than revolution. Pressed metal parts will gain. We look for continued emphasis on cold extrusion. Improvements will be made in tools, design, and lubrication.

In powder metals, we look forward to an inexpensive modification of a standard press which will permit faster compacting of simple parts.

Standard press lines will get increased emphasis on rapid die handling.

Predecorated Strip Uses Expected to Expand

Arthur E. Uhleen—Competition will be intensified in 1960 by a parade of new, predecorated, continuous strip steels. By 1965 they will have generated many changes in end product forming and joining methods.

Predecorated strip steels in practically any pattern, any color, including the whitest of white for appliances, are available or soon will be. They can be ten times more abrasion resistant than materials presently used. Many new types are ready to emerge from research and development.

Metalworking people will also see predecorated strip "loaded" with zinc, producing undercoats with excellent rust resistance.

New adhesives replacing heat welding methods will aid the use of strip in mass production.

In the near future, look for better, higher speed coatings that will cure in seconds and production rates above 2000 fpm.

Programed Tube Bending To Bow In During 1960

J. E. Hawking—We will witness more "moving" to replace "removing" of metal. An example: Bending extruded aluminum to form simple corners. Hundreds of fabricators still employ the expensive cut, trim, notch, miter, braze, and grind to make a single square corner. We foresee many of them switching to the comparatively easy single machine bend.

New developments of tube and shape bending processes include: Specialized high speed machines with the addition of automatic ejection, hopper feed, and transfer mechanisms to eliminate handling. The bending machine can also perform other operations like punching or flattening of a tube. New presses are readily adaptable to those combinations.

Bending presses without mandrels will get increased play. Models are ready with a capacity for 3 or 4 in. tubing. Their use for sections, shapes, extrusions, square tubing, and bars is expected to increase. Reason: Simple tooling requirements and high production speeds.

A trend should develop toward greater flexibility and wider capacity. Quick, easy setup and tool changes, interchangeable stops and gages for 10 minute job changes.

Programing with cards and tape will probably be introduced for the first time in 1960 on a limited scale followed by rapid growth in applications and development.

Refractory Metal Forming Called Major Obstacle

Preston L. Hill—Two major problems face producers of advanced weapon systems during the next two to five years: Temperature and availability.

We are entering a new era of metal technology. Only four metals—tungsten, tantalum, molybdenum, and columbium, are abundant and inexpensive enough to merit consideration as bases for alloys.

Lightweight components must utilize every ounce of metal. Metalworking people must devise new methods and forming techniques. For example, the upper limit of current production equipment is 2500° F while proper working temperatures for those metals are above 3000° F. Technology must shift its sights upward.

Powder metallurgy is economical and attractive. No ingot breakdown is required. Consolidation and densification are achieved through solid state diffusion. Three factors limit size and composition of the products: Capability of the cold-pressing equipment, the sintering furnaces, and the lack of prealloying knowhow.

The problems imposed by the higher working temperatures cannot be minimized. The optimum working temperatures of refractory metals are either near or above the melting point of the tools which will be used. Extremely fast acting equipment is called for. Rolls and tools will quite possibly require cooling. High energy rate explosive deformation may also be required.

Development programs of the Air Force Manufacturing Methods Division are intended to provide solutions to those problem areas.

Predicts Forming Method That Works Molecules

J. W. Nicholas—Increasing use of high energy rate processes is the most important trend in metalworking today.

Explosive forming is the most promising for large scale application. Major problems to be overcome are handling and protection of equipment to increase life.

Application to powder metallurgy will increase practical size and reduce piece cost. The utilization of adiabatic (heat conservation) methods may substantially reduce the production cycle.

Capacitor discharge forming has some potential advantages over explosive forming in increased control and reduced handling. Solution of control circuit and structural design problems should make the process practical for small to medium sized parts.

High energy rates will also be profitably

Forming

VASIL PHILIPCHUK
Manager, Special Projects Dept.
National Northern Div., American Potash & Chemical Corp.
West Hanover, Mass.

C. H. SMITH JR.
President
Steel Improvement & Forge Co.
Cleveland

R. J. WEAN JR.
President
Wean Equipment Corp.
Warren, Ohio

FRED LYIJYNEN
Staff Manufacturing Engineer
Stamping Div., Chrysler Corp.
Detroit

employed in the plastic working of metals. Methods include explosive, electromagnetic, and high speed mechanical and gas operated forging and extrusion presses.

We will see an increasing application of ultrahigh speeds to metal removal. Successful cuts have been made on high strength steels at more than 120,000 sfpm. Such speeds will be applied to tool bits and abrasives—even higher speeds will be used with ions and electrons as the metal removal agents.

A little farther in the future: The tremendous forces generated by the interaction of high electric current and magnetic flux densities will be utilized in forming and machining. By properly focusing and controlling them, we will directly work each molecule instead of having to transmit forces from the surface.

Look for Explosive Forming To Tackle Ton-Size Parts

Vasil Philipchuk—Many companies are looking to explosive forming as one solution to high manufacturing costs. During 1960, managers will initiate programs to determine the practicability of explosive forming parts considered too costly to fabricate by conventional methods. Many smaller firms will utilize that method to form parts of large assemblies to reduce tooling costs. Some work is already in progress.

The major areas in explosive metal fabrication continue to be: Cold forming, bonding, welding, compaction, and to a limited extent, flanging. Explosive forming of ton-size parts is most likely to have the greatest impact on industry since they cost the most to fabricate by the other methods.

Many technological problems have yet to be solved. A technique for each part has to be created.

Sees More Refractory Metal, Nonmetallic Forgings

C. H. Smith Jr.—Adapting Space Age materials to everyday needs is one of the most challenging assignments to face us in the 1960s.

Molybdenum, tantalum, tungsten, titanium, and columbium should soon be in forged, high performance parts in many other segments of American industry. Titanium is already finding its place. Tantalum and columbium need new and better die materials which will perform at the low temperatures at which the metals are forged (below 600° F). We also need to overcome brittleness and other shortcomings of molybdenum, tungsten, and titanium.

Other problems remain to be solved before the ultra-high-strength steels such as X-200 and H-11 tool steel can be adapted to industrial uses.

Recent advances have been made in the fabrication of Space Age metals. Much has been accomplished in putting a variety of extrusions (orifice, blind, secondary, and combinations of those) on a production basis. More progress is expected in nonferrous materials and an even greater range of metals.

The coming year should also see more utilization of new metallic, cermet, and nonmetallic forgings.

We feel a need for inexpensive coatings to protect forgings from decarburization. Considerable work has already been done with metallic and organic materials which form a tight chemical or mechanical layer. All difficulties have not been overcome.

Cites Continuing Progress In Conventional Forming

R. J. Wean Jr.—There has been much conjecture about metal forming presses being made virtually extinct as exotic forming methods, such as explosive, magnetic, and stretch forming, come of age. Such thinking fails to take two basic facts into account: 1. Although exotic forming has been used successfully to solve special forming problems, it does not necessarily mean that such methods would be economical in the everyday jobs. 2. Presses have undergone constant development to stay abreast of industry requirements.

Another factor weighing heavily in favor of presses is the trend toward coil processing. Fabricators are becoming aware of the many economies in buying coiled metals, rather than sheet stock, and presses have the multiple function versatility needed in coil processing—blanking, stamping, piercing, notching, deep and shallow drawing.

Presses may take a back seat to the more romantic exotic forming methods when it comes to publicity, but press sales will probably continue to pace the growth in metal forming throughout the boom of the sixties.

Molecular Deposition of Metal On Plastic Shows Promise

Fred Lyijynen—Plastic tooling has made a considerable impact on metal forming.

One of the newer applications: Combining metal fibers and epoxies to increase physical properties. Metal fibers can be hand laid, compression molded, or sprayed on with a new type gun. The amount of metal depends on the

Hyde Park
ROLLING MILL EQUIPMENT
at Florida Electric Steel Mill
TAMPA, FLORIDA

GRAY IRON and ALLOY IRON CASTINGS

Up to 80,000 Pounds

For 65 years, Hyde Park Foundry and Machine Company has been developing, designing and manufacturing rolls, rolling mills and auxiliary equipment for steel mills, everywhere.

The "Red Circle" is your guarantee of quality. You will find it on every roll. It is symbolic of the highest integrity and efficient performance of all Hyde Park rolling mill equipment.

Hyde Park Engineers are always ready to co-operate with you in selecting and applying the rolls and equipment best suited to your operation.

Our Foundry and Machine Shop facilities are equal to any of your requirements.

Photograph showing Hyde Park 18" 2-Hi Bar Mill Stand at Florida Electric Steel Mill, Tampa, Florida.

ROLLS

Nickel Alloy Grain Rolls
Grain Rolls
Chilled Rolls
Nickel Chilled Rolls
Moly Rolls
Nodular Iron Rolls

All Grades Nickel Alloy Iron Rolls for Hot and Cold Rolling

ROLLING MILL EQUIPMENT

Bar Mills
Merchant Mills
Roller Tables
Stretcher Levellers
Sheet Mill Shears
Special Machinery
Sheet and Strip Mills
Pinion Stands
Reduction Drives
Roll Lathes
Machine Work

CASTINGS

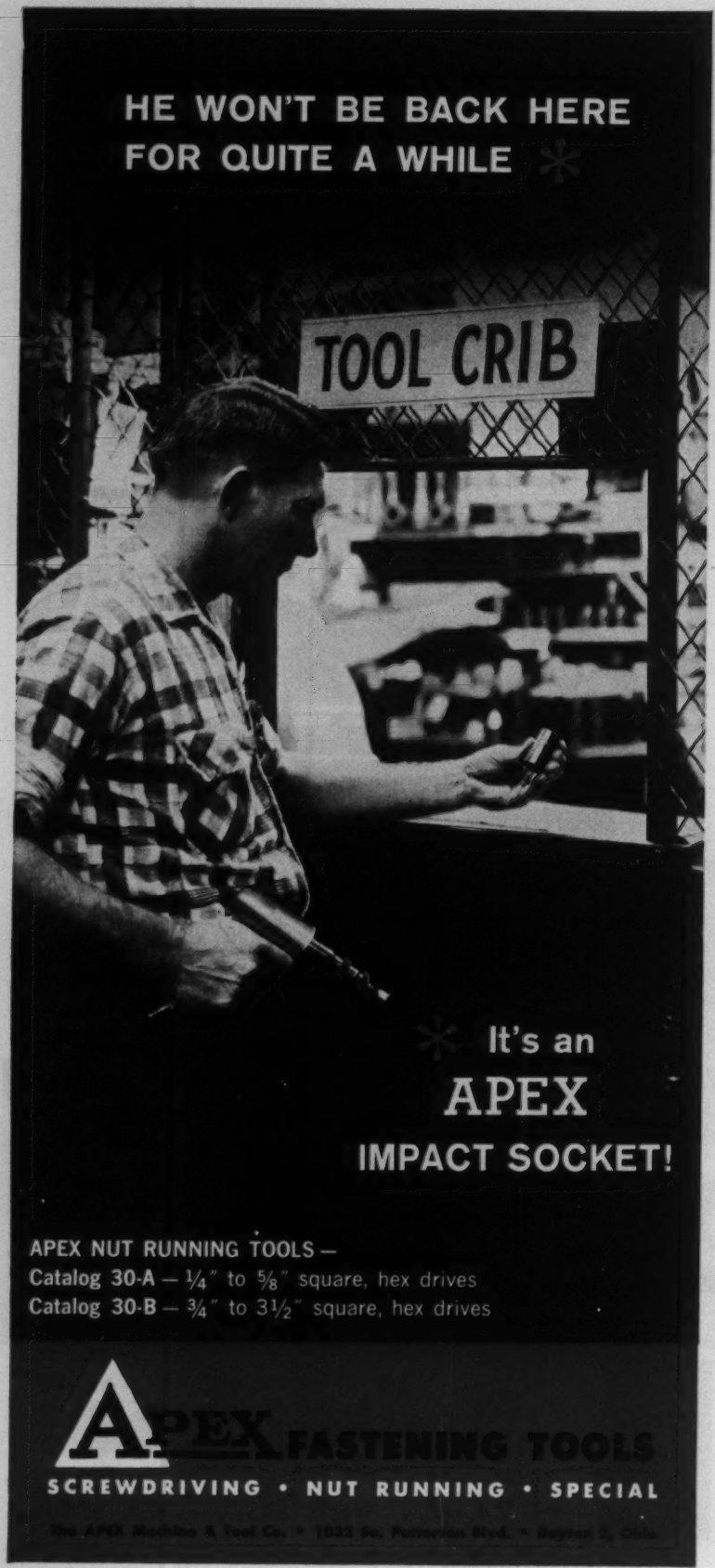
Furnace Castings
Heavy Die Castings
Bases
Housings
Machinery Castings
Slag Pots
Heavy Tool Castings
Floor Plates

500 TON LEVELLER

50" ROLL LATHE

RED CIRCLE Rolls ALLOY-CHILLED

Hyde Park
FOUNDRY and MACHINE CO.
HYDE PARK, WESTMORELAND COUNTY, PITTSBURGH DISTRICT, PA.



Forming

C. C. CADITZ
President
Northern Metal Products Co.
Franklin Park, Ill.

VERNON H. MONTEIL
Research Engineer
Rocketdyne Div.
North American Aviation Inc.
Canoga Park, Calif.

type and usage of the tool.

Molecular deposition looks promising. (Nickel is backed up with an epoxy.) Some forming dies now in production show good possibilities.

Predicts Decline in Number Of Captive Stamping Shops

C. C. Caditz—The coming year should be one of continued progress. We note a growing awareness on the part of the larger end product manufacturers that automatic integration (especially as a sideline) has been extremely costly.

We look for some closing down of inefficient and costly captive stamping operations and increased buying from stamping specialists.

Precise Control Main Problem In Explosive Forming

Vernon H. Monteil—Increasing competition and the extreme need for decreased costs of fabrication have turned aircraft and missile people to explosive forming.

Probably the most important problem to be overcome is complete control. Since a tremendous force is involved, poor judgment can easily break a die. The solution probably requires variation of explosive conditions.

Because the method is relatively new,

Forming

F. A. MONAHAN
Manager, Mfg. Devel. & Process Spec.
Convair Div., General Dynamics Corp.
San Diego, Calif.

die thickness, materials, and components (holding fixtures) have not been investigated to any great extent. As a result, each new shape requires a certain amount of preliminary effort.

The method offers the greatest advantages in the production of large parts, close tolerance parts, or those requiring high forming forces with limited production.

As far as the missile and aircraft industry is concerned, I think the method has a tremendous future.

Basic Industry Holds Up Progress in Aircraft

F. A. Monahan—Basic industry is not keeping up with the aircraft designer's requirements.

The transition from aluminum to steel and refractory materials is producing an impact on metalworking that's approaching a crisis. Here are some problems:

1. Milling cutters last only 18 minutes, even with the best coolants.
2. Sandwich structures require too much cleanliness; tooling is too elaborate; and individual encapsulation is required.
3. Sheet metal tolerances of finished assemblies are often less than 0.005 in.
4. Forgings must be "born to size," have no draft.
5. Web thicknesses of extrusions are less than 0.050 in.
6. We must use more curved shapes in the heavier materials.
7. Shorter production runs are common.
8. We need more all purpose, numerically controlled machines with a minimum of tooling.
9. Reliability will require more data analysis.

The aircraft industry is starting the "steel" cycle. The speed with which each basic industry progresses will determine its markets.

In miniaturized products, fastening delicate components securely in place can be a major production "headache". If the fasteners used are not accurate, uniform and easy to install, assembly operations become a costly nightmare.

To help solve this critical problem, Fischer is supplying precision turned miniature nuts that are tapped square (within 1°) to Class 2 tolerances, with lengths and diameters held to +.000″ and −.005″. Sizes range from ⅛″ hexagon and include standard, special and odd size or shape nuts with standard or special threads from No. "0". In addition, all Fischer nuts are furnished burrless, cleaned and ready to use.

Whatever your application, if you require extreme accuracy and prompt "on schedule" delivery at competitive prices . . . let Fischer quote your next miniature nut order.

WRITE TODAY FOR ADDITIONAL MINIATURE DATA.

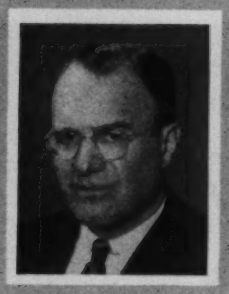
there's no premium for precision at

Fischer SPECIAL MFG. CO.

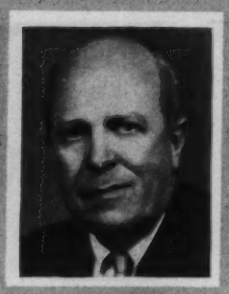
476 MORGAN STREET • CINCINNATI 6, OHIO

8814-PS

CHARLES L. FAUST
Chief, Electrochemical Eng. Div.
Battelle Memorial Institute
Columbus, Ohio



LOUIS L. STOTT
President
Polymer Corp.
Reading, Pa.



J. O. J. SHELLENBERGER
Amchem Products Inc.
Ambler, Pa.

T. J. KEARNEY
Assistant Manager
Industrial Equipment Div.
Detrex Chemical Industries Inc.
Detroit

1960 FORUM ON TECHNICAL PROGRESS

Cleaning and Finishing

Electrolytic Cutting Method Tames Tough Metals

Charles L. Faust—Cemented tungsten carbide, titanium, and Udimet can be cut as easily as mild steel or brass with electrolytic machining. The process has much to offer for fabricating hard-to-machine materials or those sensitive to surface damage caused by chip-by-chip removal methods.

Fluidized bed techniques have interesting possibilities for coating small particles with other materials.

New coating systems for zinc diecastings are being adopted by the metal finishing industry. They should give much longer outdoor protection. Unsightly white corrosion products may be delayed up to five years instead of a few months. The techniques should be adaptable to steel, brass, and aluminum. New techniques in chromium plating are contributors to this brighter future.

The need for protection at high temperatures has resulted in new ceramic coatings and techniques. Possibilities are seen for coating systems involving ceramics with metal reinforcement. There is much to be done with laminates of different metals as coatings.

Fluidized Plastic Coating Eliminates Solvents

Louis L. Stott—A new coating technology is especially applicable to metal stampings, castings, or wire goods. The object to be coated is preheated above the melting point of the coating material, then immersed into a fluidized bed of finely divided plastic powders which impinge on the metal surface and coalesce to form a continuous coating. Coating thicknesses of 0.005 to 0.050 in. are obtained in a single dip.

Coating powders include vinyls, cellulosics, epoxies, and solvent resistant materials such as nylon, polyethylene, and chlorinated polyethers. Applications include appliance racks, furniture, and general hardware.

Ten proprietary installations have been established in industry, and custom coating is available from five sources.

Reports Expanding Trend Toward Painted Aluminum

J. O. J. Shellenberger—There seems to be a growing trend to the use of aluminum—particularly painted aluminum. Preparing the metal to prevent corrosion and to make the paint adhere properly becomes increasingly important. We expect to continue to develop chemicals for special problems which will arise as the trend accelerates.

Steel, of course, will continue to be a major field. There are problems in getting chemical treatments to promote maximum adhesion between the metal base and some of the new paint finishes such as the acrylics. Considerable work is being done on the problem. Satisfactory solutions have not been found, particularly where a one-coat paint finish is required.

We are trying to automate our processes to get the best results consistently at the lowest cost.

New Methods, Solvents To Give Cleaner Parts

T. J. Kearney—The expansion of the missile industry has produced a requirement for a degree of cleanliness that necessitates a new concept of solvent cleaning procedures.

Residue control, both in kind and quantity, has assumed proportions that require a scientific approach.

MARTIN F. MAHER JR.
Manager, Metal Industries Div.
Oakite Products Inc.
New York

W. C. LOWREY
Manager, Marketing
Plastics & Resins Div.
Shell Chemical Corp.
New York

WILLIAM P. INNES
Technical Director
MacDermid Inc.
Waterbury, Conn.

R. J. STEWART
President
Cleveland Metal Abrasive Co.
Cleveland

To assist in meeting the stringent requirements, three items of major importance are:

1. Wider use of ultrasonic degreasing.
2. Production of low residue, missile grade trichlorethylene and improvements in transporting high purity solvents to maintain their original characteristics.
3. The use of the trichlorethylene vapor generator principle which delivers pure vapors to the interiors of critical areas such as fuel tanks (liquid and solid), cleansing them with a method that cannot recontaminate them. Only the condensate of a virgin vapor comes in contact with the surface to be cleaned.

Ultrasonic cleaning equipment has advanced in design and construction to the level of industrial requirements and is capable of producing outstanding results.

Precoating and Automation Are on the Uptrend

Martin F. Maher Jr.—Control of corrosion continues to be one of the major problems facing the metal industries.

Conversion coatings of the phosphate and chromate types continue to be refined and perfected, and it is expected that their uses will be extended as experience proves their efficiency in new applications.

A significant contribution is the prefinishing of metal in sheet or strip form by the producer or converter. Volume production of prefinished strip in coils up to 60 in. wide cuts unit costs, reduces capital and insurance expenses, and provides a great choice of finishes.

Need for greater precision and the growing miniaturization of parts will increase the uses of ultrasonics for cleaning. Wider use will be made of water-based solutions as media because of their favorable densities and capacity to transmit ultrasonic waves for greater surface activity.

As resistant coatings, like vinyl and the epoxies, grow in popularity, the problem of stripping finishes from rejects and paint line equipment becomes more troublesome. Greater use of additive-modified solvents seems indicated.

Several Resin Developments Slated to Appear in '60

W. C. Lowrey—Several technical advances made in 1959 will show up as improved epoxy coatings in 1960.

A curing agent that can be mixed with a solventfree epoxy system and sprayed from a conventional gun has been developed. Steel finishers will be able to buy the coatings this year.

Epoxy-coal tar coatings used for protecting pipe lines, oil derricks, and chemical plants will be supplemented by new resin-bitumen coatings. Several paint companies will offer them. They can be overcoated without bleed-through.

Epon resins are gaining a foothold in a small way in some of the traditional uses of steel. One good example is epoxy-Fiberglas pipe, combining strength, light weight, and corrosion resistance.

A number of manufacturers will offer electric motors in which the use of epoxy resin has been extended to the motor housing—a tough servicefree assembly.

New Coloring Techniques Do Not Require Anodizing

William P. Innes—A new wetting agent for nonaerated cyanide copper baths has been developed. It is unique because no water breaking occurs, so copper electrodeposited from such baths can be plated with other metals without intermediate alkaline cleaning. The agent overcomes the effect of organic contamination such as blotchy plate, pitting, and dullness without the necessity of carbon treatment.

A new method of removing chromium from all cyanide copper plating solutions will salvage many solutions which would normally require dumping. The treatment completely removes all chromium, saving the bath and eliminating necessity of expensive waste disposal procedure.

New and improved coloring techniques for zinc and cadmium plate, zinc base diecasting, copper, brass, and aluminum will offer many new possibilities to metalworking. Possibilities range from bright pastel shades to an attractive jet black. It is possible to produce bright pastel colors with excellent corrosion resistance on aluminum and castings without anodizing.

New water soluble resins have been developed for coating dyed chromate finishes and other metal parts. They have excellent durability and provide good corrosion protection and may be used as a base for other organic coatings. The advantage of using a water soluble resin is that the work can be coated without being dried.

Improved Metal Abrasive Uniformity Predicted

R. J. Stewart—New methods of heat treating metal abrasives are being developed and will be utilized in the year to come. With greater control in heat treating processes. more meaningful standards of hardness and microstructure can be established.

In the next two or three years, new metallurgical studies must be made to reduce the cost of metal abrasives. New processes must be developed to further control particle size and configuration.

An additional problem which must be overcome in the near future is the correlation of various laboratory testing methods with production results. There is a pressing need for a physical laboratory testing machine and proper interpretation of results which could be universally accepted by the abrasive industry, the SAE, and abrasive users.

The abrasive industry is also seeking

Cleaning and Finishing

MAX B. ROOSA
Executive Vice President
Parker Rust Proof Co.
Detroit

HENRY L. KELLNER
Technical Director
Lea Mfg. Co.
Waterbury, Conn.

MYRON B. DIGGIN
Vice President & Technical Director
Hanson-Van Winkle-Munning Co.
Matawan, N. J.

quality control techniques and testing procedures to narrow quality standard ranges. That would help in predicting performance of an abrasive.

The trend toward the use of more efficient and longer lasting abrasives, increasing in the last several years, has resulted in more users improving their cleaning equipment and maintenance.

We predict that this trend will accelerate at a tremendous rate during the next several years.

New Phosphate Coatings Benefit Prepainting

Max B. Roosa—It has become possible to clean, process, and rinse near room temperature prior to phosphate coating. The developments have meant tremendous savings in heat costs to manufacturers, in addition to easier service and maintenance. It is predicted that in 1960 the cold phosphate system will become the production and quality standard in the metal surface preservation field.

Lines already in production will treat aluminum coils up to 66 in. wide with a conversion coating of the chromate-chromic oxide or chromate-phosphate type and then paint, in continuous operation, at line speeds in excess of 100 feet per minute. Manufacturers will be able to purchase chemically treated and painted coil stock, then form it into the finished product.

Many of the large automotive manufacturers are setting up production installations to cold extrude parts for '60 and '61 models. Zinc phosphate coatings combined with reacted-on lubricants have made it possible to extrude steel and aluminum beyond expectation. The treatment is a must in the pretreatment cycle. Certainly, cold extrusion of metals will see much wider use in 1960. It is much cheaper to move metal than to remove it.

Because of experience gained in 1959, look for vast changes in production practices for cold heading rods and for wire drawing. New installations will handle rods or wire in continuous coils at speeds up to 600 feet per minute.

Continuous shot blasting will remove all scale; the rod will continue through a bath to produce a zinc phosphate coating in less than 10 seconds; and intermediate steps, including sizing and recoiling, will all proceed in continuous operation. The greatly improved lubrication provided makes it possible to do more difficult jobs, extends tool life, maintains better dimensional tolerance, and increases die life in subsequent thread rolling. The continuous process greatly reduces the financial outlay and floor space required for the physical plant.

Liquid Abrasive Compositions Coat Automated Buffs

Henry L. Kellner—For the last 25 years, a technological revolution has been taking place in all phases of our industrial economy. Metal finishing, or so called surface preparation, has been no exception.

One important segment, buffing and polishing, has not kept up the pace due to the complexities peculiar to its operation.

Builders of automatic buffing machines sparked the emphasis on automation. Machines can automatically buff and polish items whose geometry previously precluded anything but hand operation. But automatic buffing and polishing appeared to be limited by the need for an efficient, automatic means of conveying buffing compound to the wheels.

The challenge has been answered by sprayable, stable, water base, emulsion type, liquid abrasive compositions used with modern automatic spray guns and other special equipment. Consistent and uniform finishes on all types of metals, or even plastics, are insured.

Downtime for charging buffing bar compound or reheading a wheel is reduced. Hazards of hand application and bar breakage are eliminated. Pressure feed or pumping systems can be designed to supply liquid abrasive compositions continuously for a full working day or for several days.

Often, less composition is used. Cleaning of metals buffed with liquid spray is either eliminated or simplified, if water base, emulsion type liquid abrasives are used. Residual film removal merely requires a hot water rinse or mild cleaner.

The greases and abrasives used are the same as those found in bar compositions. The proper amount of water is added to provide necessary fluidity for spraying onto a rotating wheel, but the water instantly evaporates from the revolving buff.

Liquid spray buffing lowers buff costs. A starved or bare buff never rubs against the surface being finished, and water base liquid compositions provide a cooling lubricating action. The result: Buffs last up to five times longer.

Predicts Growth of Improved Nickel and Chrome Methods

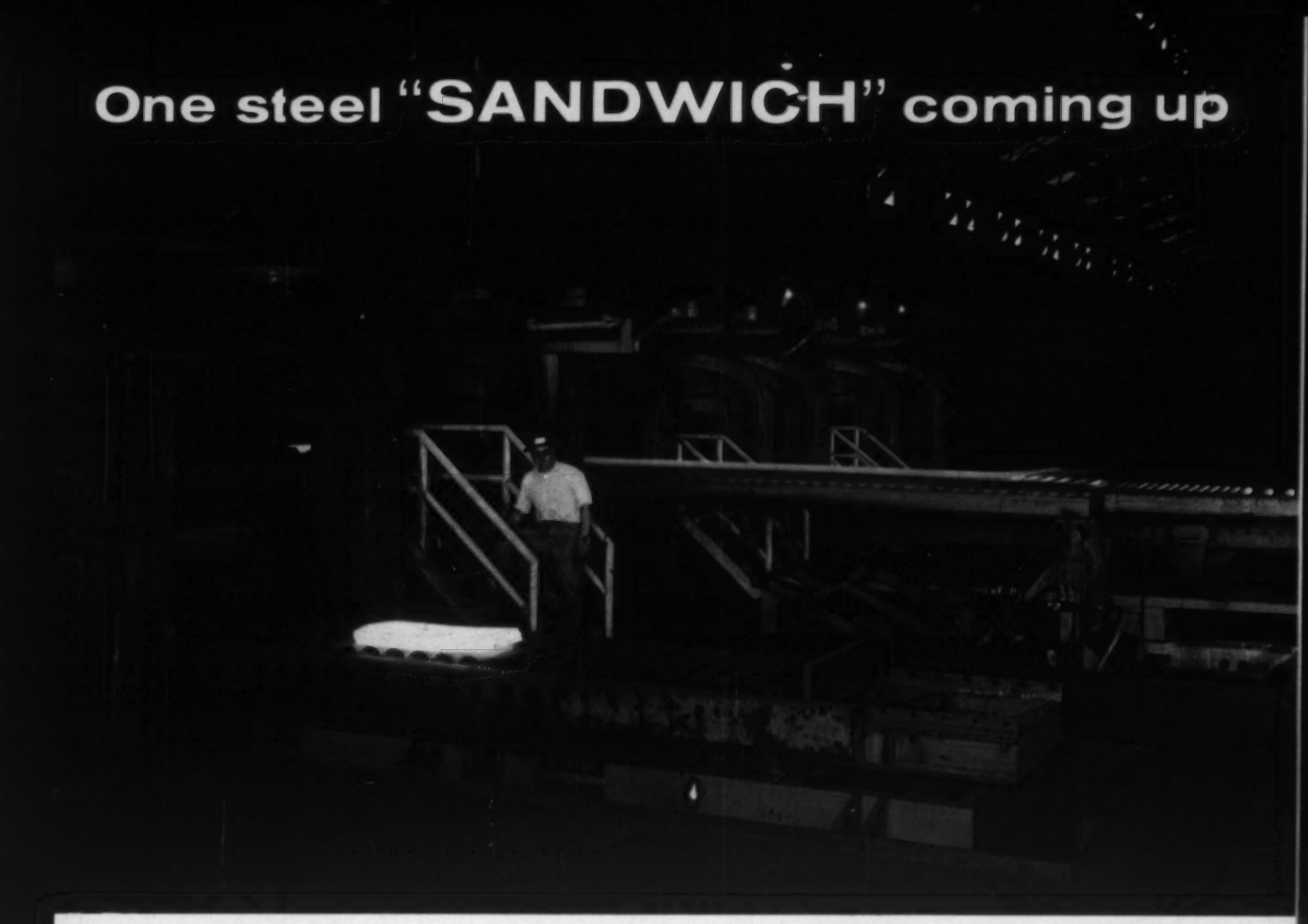
Myron B. Diggin—An important trend in the metal finishing industry is the widespread adoption of duplex nickel systems to the finishing of exterior automotive trim.

The process involves the deposition of two separate layers of nickel on the basis metal. The first deposit, a semibright coating, provides high leveling (scratch hiding) characteristics coupled with good ductility and low internal stress. The second layer is bright nickel which also has good leveling characteristics but is less ductile than the semibright deposit.

Another important characteristic: The substantially sulfurfree content of the semibright deposit imparts high corrosion resistance to the semibright.

As corrosion takes place, the bright deposit is attacked first from the surface inward, then laterally along the interface between the bright and semibright nickels. The bright nickel acts as a

One steel "SANDWICH" coming up

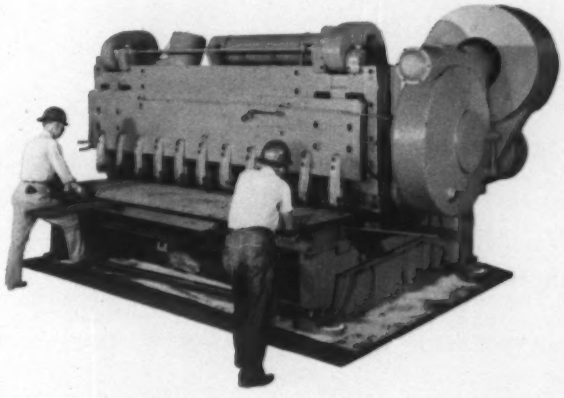


A typical example of **Ingersoll** versatility in fine quality specialty steels

For a wide variety of product applications, Ingersoll produces specialty steels made up of composite layers. These include Ingersoll's famous IngAclad stainless-clad steel, soft center steel, and 2-ply knife steel—all widely used in industry.

To make such sandwich-type steels properly calls for special experience and skill, special care and handling from melting to rolling to shearing and blanking. But that's typical of *all* the specialty steels Ingersoll makes—where fine quality is the standard at every step of the way to make sure the steel you get meets your exact specifications.

And that's the best reason of all why Ingersoll Steel is such a good name to know, a good place to go for the specialty steels you need. Try us—we think you'll agree.



INGERSOLL STEEL
B-W
BORG-WARNER

SAW STEELS • HIGH SPEED POWER AND HAND HACK SAW STEELS • KNIFE STEELS • STAINLESS STEELS • HEAT RESISTING STEELS • INGACLAD STAINLESS-CLAD STEEL SHEETS • CROSS ROLLED STEELS • CARBON ELECTRIC STEELS FOR AUTOMOTIVE, TRACTOR, AND OFF-HIGHWAY EQUIPMENT CLUTCH DISCS AND CLUTCH STEERING RINGS • ALLOY STEELS • ULTRA HIGH STRENGTH STEELS • SOFT CENTER AND OTHER AGRICULTURAL STEELS • FORGING QUALITY ELECTRIC FURNACE INGOTS TO 23,000 POUNDS

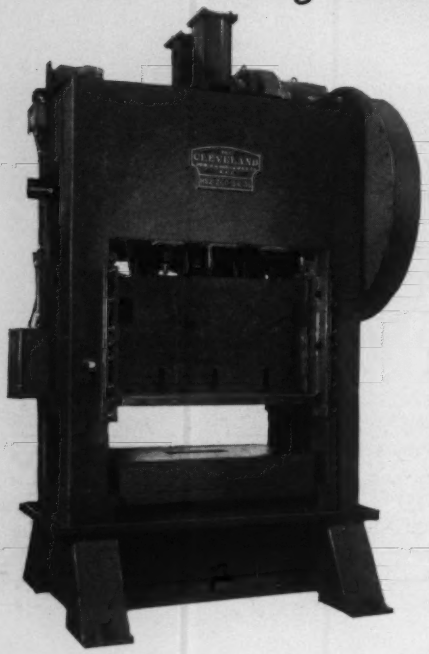
Ingersoll STEEL DIVISION

Borg-Warner Corporation • NEW CASTLE, INDIANA

For Greater Economy In Metalworking

CLEVELAND

Cost-Cutting PRESSES

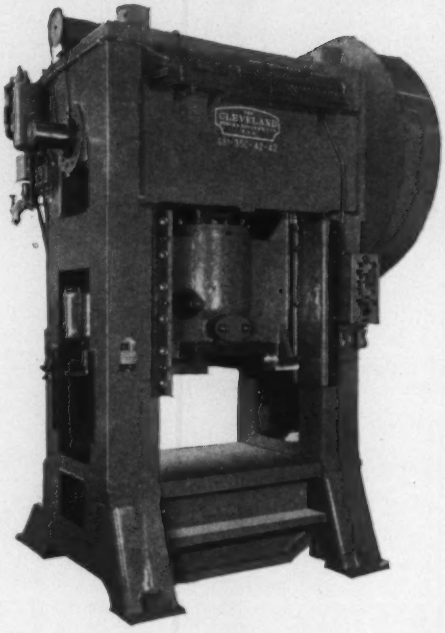


Cleveland high-speed Double Eccentric Press, 200-ton capacity, operates at 50 to 150 strokes per minute for high-speed punching, shearing, perforating, bending and forming.

Are production breakdowns, slow outmoded presses and mounting maintenance costs destroying your profits? A check of your press performance records may show you're already paying for new presses . . . *without their benefits.*

For lower operating costs, quicker starting, increased production, investigate the new minimum-maintenance Cleveland Presses. Our engineers are ready to help you plan a program of replacing old inefficient presses with modern cost-cutting Cleveland Presses of the exact type, size and capacity to meet your need.

You get better stampings for less with a Cleveland Press.



Cleveland's cost-cutting Single Eccentric Press, 350-ton capacity, operates at 60 strokes per minute, has air-counterbalanced slide and auxiliary air brake on flywheel.

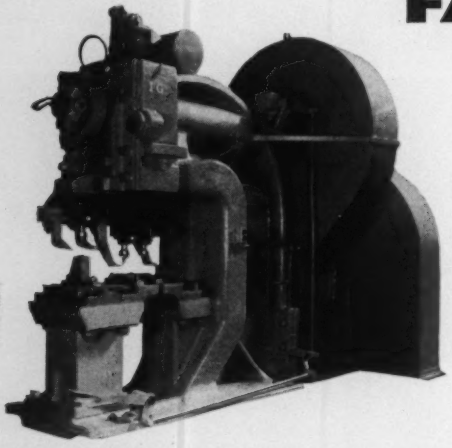
FABRICATING TOOLS

For Plate and Structural Steel

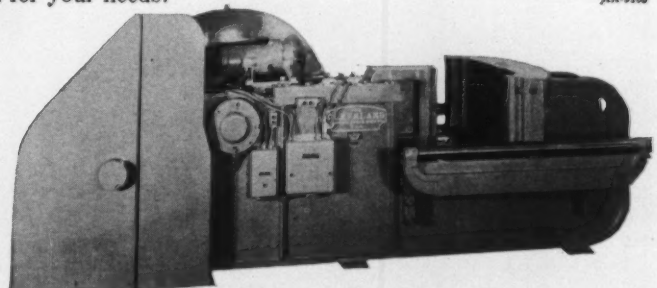
Ruggedly built for profitable production and simplicity of operation, Cleveland Fabricating Tools are designed for trouble-free operation and years of service—a fact proven by leading shipyards, bridge builders, railroads, structural shops and boiler makers since 1880.

For punching, coping, notching, shearing, bending and planing I-beams, steel plate, bars, angles and other structural shapes, you can do it better, more economically with Cleveland Fabricating Tools. Write for Catalog #9 to help you determine the correct tool for your needs.

AA-9105



Cleveland I G Beam Punching Machine equipped with 3 gaged punching attachments, one high and two low die holders, 24" throat, completely enclosed gears and flywheel, punching capacity: standard 6" to 24" I-beams in flange and web. Other capacities and sizes available.



Cleveland No. 2 Bending & Straightening Machine, welded steel frame, completely enclosed gears and flywheel, arranged for direct-drive motor and equipped with power adjustment to plunger through separate motor. Capacity: bend or straighten 24" I-beams vertically or horizontally.

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

Cleaning and Finishing

H. C. IRVIN
President
Allied Research Products Inc.
Baltimore

H. L. BENNER
Electroplating Service Manager
Sodium Products Div.
E. I. du Pont de Nemours & Co.
Wilmington, Del.

E. S. GARVERICH
Manager, Technical Service Dept.
Chemical Specialties Div.
Pennsalt Chemicals Corp.
Philadelphia

HAROLD P. RANSBURG
Vice President
Ransburg Electro-Coating Corp.
Indianapolis

sacrificial electrode protecting the semibright deposit. The base metal is shielded from corrosive attack for a much longer period than has been available from nickel deposits which consisted of single layers containing sulfur contamination.

While duplex nickel has remarkably improved the corrosion protection of nickel deposits, improvements in chromium plating will add further to the corrosion resistance. Improvements in chromium plating include duplex chromium; deposition from a high ratio, high temperature, chromic acid-sulfate bath; and heavy deposits ranging from 0.000030 to 0.00010 in.

Although duplex nickel systems were patented as early as 1935, they have come into large scale use only within the last few years. Improved semibright solutions now available permit higher speed operation than was formerly possible. They are less expensive to operate because they may be continuously purified by activated carbon treatment removing harmful breakdown products.

Attractive Finishes to Be More Important in 1960

H. C. Irvin—A combination of factors is changing the pattern of metal finishing practices. They stem from the hard facts of economics as well as from the ever increasing demand for better protective finishes. No longer can new protective systems be developed without equal attention being given to eye appeal.

Little success is indicated for new finishing systems that cannot be adapted to existing methods of automatic application.

Although today most finishes are applied to parts either by the fabricator or by subcontract job shops, the demand for prefinished mill stock is increasing. Many types of mill finished stock are already available. Of course, prefinished stock can be used only when the mill finish meets the final finish requirements and can withstand fabrication processes.

Standards, particularly from a protective standpoint, are also constantly increasing, indicating the need for new approaches in research and development.

Much research attention is being directed to multilayer finishing systems. They include unconventional combinations of metals, conversion treatments, and organics. In this area too, the economic factors of easy application and automatic application are at work.

Better Chrome Plate Based On New Copper Coating

H. L. Benner—A new leveling cyanide copper bath is finding wide usage on parts which are to be chromium plated.

Deposits with maximum scratch hiding ability exhibit a laminar structure and form an excellent basis for subsequent electrodeposits. Superior corrosion resistance is indicated from studies. An extensive outdoor corrosion testing program is being carried out, with panels exposed at significant locations, to provide a check on accelerated tests and indicate optimum thicknesses of copper, nickel, and chromium.

The new leveled copper process, together with improved methods for applying nickel and chromium, are cited as reasons for expectation of general improvement in performance of chromium plate on parts.

Double salts of sodium cyanide-copper cyanide and potassium cyanide-copper cyanide are meeting with increasing acceptance. The readily soluble, white salts, made from filtered solutions of the cyanides, have proved their merits with respect to convenience, high purity, and simplified control. Their use is expected to expand considerably.

Integration of Chemicals, Equipment Pays Off

E. S. Garverich—Two trends will become increasingly important in 1960 in the field of metal surface preparation.

First, there will be increasing emphasis on integrating metal processing chemicals and the automatic equipment on which they are used. While equipment should be designed to get the most effective utilization of chemicals, chemicals should be specified to give peak performance in the equipment. Practice has been to buy a machine, then decide what chemicals should be used. Today, we look at the complete system.

Second, there will be a trend toward chemicals in solid form at lower cost to the user. They are cheaper, easier to handle, and do not cause abrupt changes in bath composition, since they go into solution gradually.

New Paint Systems to Ease Color Change, Aid Uniformity

Harold P. Ransburg—An automatic, quick-color-change system, used with electrostatic spray processes, permits colors to be changed within 6 seconds. It was first installed a little over a year ago for spraying automotive interior trim parts. We anticipate fairly wide use.

A recently developed system allows circulation of the paint up to the atomizing head and at the same time permits the paint to be quickly triggered off and on at the head. The system eliminates settling of high specific gravity and quick settling coating materials in the paint lines. It is especially helpful when used with the quick color change unit, or one which is triggered off and on, since in both types the paint is subject to settling.

The circulating system also provides for

Cleaning and Finishing

C. R. CLINE
Assistant to the President
Wheelabrator Corp.
Mishawaka, Ind.

J. J. HARGARTEN
Service Manager
Chlorine Products Div.
E. I. du Pont de Nemours & Co.
Wilmington, Del.

A. E. CARPENTER
Chairman
E. F. Houghton & Co.
Philadelphia

far better color control by eliminating settling of the pigments in the lines due to its higher flow rate. It also simplifies the equipment required for large automatic systems involving many atomizing units.

To use a circulating system, it was necessary to develop better paint pumps, especially for heavy bodied primer materials of an abrasive nature. Such pumps are being incorporated into noncirculating systems, with greatly increased pump life and reliability and a corresponding decrease in maintenance.

A tester used to measure the electrical resistance of the coating material has been developed. Generally, coating materials which fall within a given resistance range will atomize most satisfactorily, although the electrical resistance is only one factor in electrostatic sprayability. The paint tester eliminates much guesswork on the reduction of the coating material and speeds the selection of the proper solvents.

Abrasive Blasting to Gain In Steel Manufacturing

C. R. Cline—Several significant developments and applications of abrasive blast cleaning promise to make a tremendous change in the established procedures for finishing steel mill products within the next few years.

Abrasive blasting of slabs, billets, and blooms for scale removal in the conditioning departments prior to inspection will result in vast improvements. Less costly and more complete defect removal in the early processing stages means better surface quality and reduced metal losses. Abrasive blasting is adaptable to automated conditioning lines as well as to batch operations.

Automating of wire and bar drawing lines has been aided by replacing conventional batch-type pickling with blast descaling and establishing continuous production lines. The conversion of hot rolled rod to finished wire or finished bolts in one continuous operation is an accepted process increasing production and reducing cost of cold drawn products.

Blast descaling of hot rolled carbon sheets and strip offers the basic steel producer impressive savings. Several lines at steel mills show a saving of valuable space and a reduction (up to 75 per cent) of acid pickling requirements.

Better surface preparation provided by blast descaling of structural steel members increases life of the surface coating, thereby reducing maintenance. Surface preparation has been considered an added production cost, but it is often true that savings can result from use of properly cleaned structurals and plates. Benefits from proper surface preparation carry over to the ultimate consumer. Millions of dollars can be saved in maintenance and painting costs.

Trichlorethylene Based Finishing Shows Promise

J. J. Hargarten—Last year saw the first plant installation of a revolutionary system for complete finishing of metal—a three step method for cleaning, phosphatizing, and painting—based entirely on trichlorethylene. Full scale commercialization in 1960 is expected to have a major impact upon the costs and safety of metal finishing operations.

The cleaning step utilizes trichlorethylene in conventional vapor degreasing equipment. The work then goes to finishing steps—without the inclusion of a drying step prior to painting. This can reduce operating costs, investment, and floor space requirements. In addition, the hazards of using highly flammable paint thinners are practically eliminated.

The most radical innovation is the development of the anhydrous, trichlorethylene based phosphatizing process which emerged from the laboratory stage early in 1959. Now it is possible to clean and phosphatize parts in a simple two stage system which produces a dry part ready for immediate painting.

Addition of the new trichlorethylene based painting process completes a highly efficient and compact finishing system. This process, which utilizes either dip or spray-in-vapor paint application, features highly efficient use of paint, elimination of drip areas and drying ovens, plus elimination of flammable thinners.

Experience with several production units in 1959 demonstrated economies and other advantages. All operations are completed on parts for the engine of one of the new compact cars in only 15 minutes in a single, continuous, 65 ft hooded unit.

Water Soluble Lubricants To Aid Metal Finishing

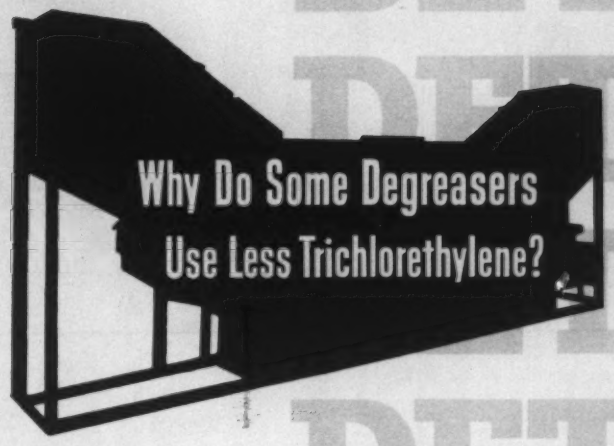
A. E. Carpenter—Much trouble can be eliminated by studying the type of processing material. A heavy, black sulfurized drawing or cutting oil left on the parts until it has aged is much more difficult to remove than a synthetic chemical compound, neutral in its effect on metals. A number of nonpetroleum coolants and lubricants can be removed readily with water without the need for high alkalinity. Degreasing with solvents will not, however, clean off such compounds.

It is possible to simplify cleaning and finishing operations by starting at the prestages of metal fabrication. We expect that more metalworkers will look at the machine and press shops to aid finishing by utilizing improved compounds in the earlier stages.

We see some standardization arising out of the confusing myriad of cleaners formerly offered. Cleaning compounds which at one time appeared to be of dissimilar types can now be classified into a few general groups: Those best suited for hot or cold still tanks where high detergency is required; those intended for power washers where high foam is a deterrent; and specials that provide a chemically clean surface for electroplating, for cleaning after salt bath treatment, or for the cleaning of nonferrous metals.

(*Please turn to Page* 294)

DETREX
DETREX
DETREX
DETREX



Unnoticed Changes in a Metal Cleaning Operation Often Affect Solvent Consumption

We were recently asked by a large user of trichlorethylene for a sure procedure for spending the least number of dollars for this chemical.

The procedure necessary to assure the most economical use of trichlorethylene is neither mysterious nor difficult, but it is precise.

To understand it, it is necessary to accept this fact:

1) When a change occurs in the product, or
2) When a change occurs in manufacturing, or
3) When a change occurs in racking, or
4) When a change occurs in the human element, or
5) When a change occurs in the machine –

a change will also occur in the quantity of trichlorethylene being consumed. It is not unusual for one of these changes to occur every month, and many times it will go unnoticed. The *only* procedure that will get the *best* result is:

1) To ascertain the necessary facts, and
2) Have expert appraisal of those facts.

A program can be set up to cover both. We have been doing it for 27 years. We would be very happy to institute such a program for you.

Depend on DETREX for Every Metal Cleaning and Processing Need

- PERM-A-CLOR NA (Trichlorethylene)
- Solvent Degreasers
- Ultrasonic Equipment
- Industrial Washers
- Phosphate Coating Compounds
- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rust Proofing Materials
- Extrusion and Drawing Compounds
- Spray Booth Compounds

DETREX CHEMICAL INDUSTRIES, INC.

Box 501, Dept. S-160 Detroit 32, Michigan

World's Largest Exclusive Producer of Cleaning Chemicals and Equipment

Cleaning and Finishing

JOHN V. DAVIS
Chief Engineer
Udylite Corp.
Detroit

D. S. GAARDER
General Manager
Industrial Sales Div.
Sherwin-Williams Co.
Cleveland

J. F. WHITCOMB
Div. General Manager
Coated Abrasives & Related Products
Minnesota Mining & Mfg. Co.
St. Paul

E. J. KUBIS
Manager, Metal Finishing Sales
J. B. Ford Div.
Wyandotte Chemicals Corp.
Wyandotte, Mich.

Quality Control, Fail Safe Systems Extend Applications

John V. Davis—The increased use of automation in industry is emphasizing the need for fail safe controls to reduce downtime, particularly in the plating industry.

Many of the newest machines are designed with a fail safe cascade electrical control circuit. The circuit actuates each successive motion of the machine only upon completion of the previous motion.

For electroplating equipment, the electrical control board is often equipped with lights indicating the sequence of operations. Stoppages and their locations are immediately flashed to the panel, signaling the operator to take prompt corrective action.

The use of hydraulic power with its simplified controls, such as that employed in plating machines, facilitates the use of fail safe controls. Other industrial automatic processes, however, can take advantage of fail safe equipment.

Mechanical failure of a plating machine has always been a costly interruption; a prolonged stoppage usually results in the loss of most of the parts in process. When a plating machine is an integral part of the entire manufacturing process, losses are greater.

Precoated Strip Promises Higher Production Economy

D. S. Gaarder—In the immediate years ahead, the use of precoated strip metals will undoubtedly become increasingly greater in the metal fabricating industry. This avenue to improving product quality and lowering production costs has already won substantial acceptance and may well become the predominant finishing technique in metal fabrication fields.

Certainly, the finishes now available augur well for such widespread use. Recent marked advances in the chemical resistance of such finishes make them at least comparable, and in many cases superior, to finishes applied after forming.

There is a definite trend toward coatings with a higher solids content. It will spur use of precoated metals, since it promises even greater economies. Conceivably, the day is not far distant when a great variety of finishes approaching 100 per cent solids will be commonplace.

Since the finish may be under considerable stress during forming operations, an extremely tight bond between finish and metal is essential. That can be assured only by careful cleaning and preparation of the metal. Rejects from coated strip already being supplied for forming are so slight as to be negligible. However, as strip coating speeds are increased and metal forming operations become more complicated and severe, the importance of metal cleaning will increase.

Design problems may also arise in connection with the use of precoated strip. But they may, in fact, have a highly desirable effect by inspiring redesign to insure more economical production and improved product appearance and performance.

New Abrasive Materials May Cure Production Woes

J. F. Whitcomb—Basic metal producers will get a helping hand in 1960 from a product (introduced in 1959) that aids the chemical cleaning process. It is a nonwoven nylon impregnated with abrasive grain to assure a consistent cleaning action, reaching into pits and removing loose scale.

Another trend is toward grinding and polishing metals, especially alloys, in coil form. The development will set new specifications for abrasive belts and will require new methods of finishing. Coated abrasive belts up to 85 in. wide will become standard as giant belt grinding machines move into the basic metal industry and the plants of metal fabricators and aircraft manufacturers. A new construction has been developed with an extra heavy, S weight backing designed for grinding and polishing.

In the soft metal industry, we see a reduction in grinding and finishing costs, resulting from another new coated abrasive belt construction. And 1960 will see the adoption of automatic deburring and chamfering of gears with "PG" wheels.

Coming: New Paint Removers, Better Cleaners, Finishes

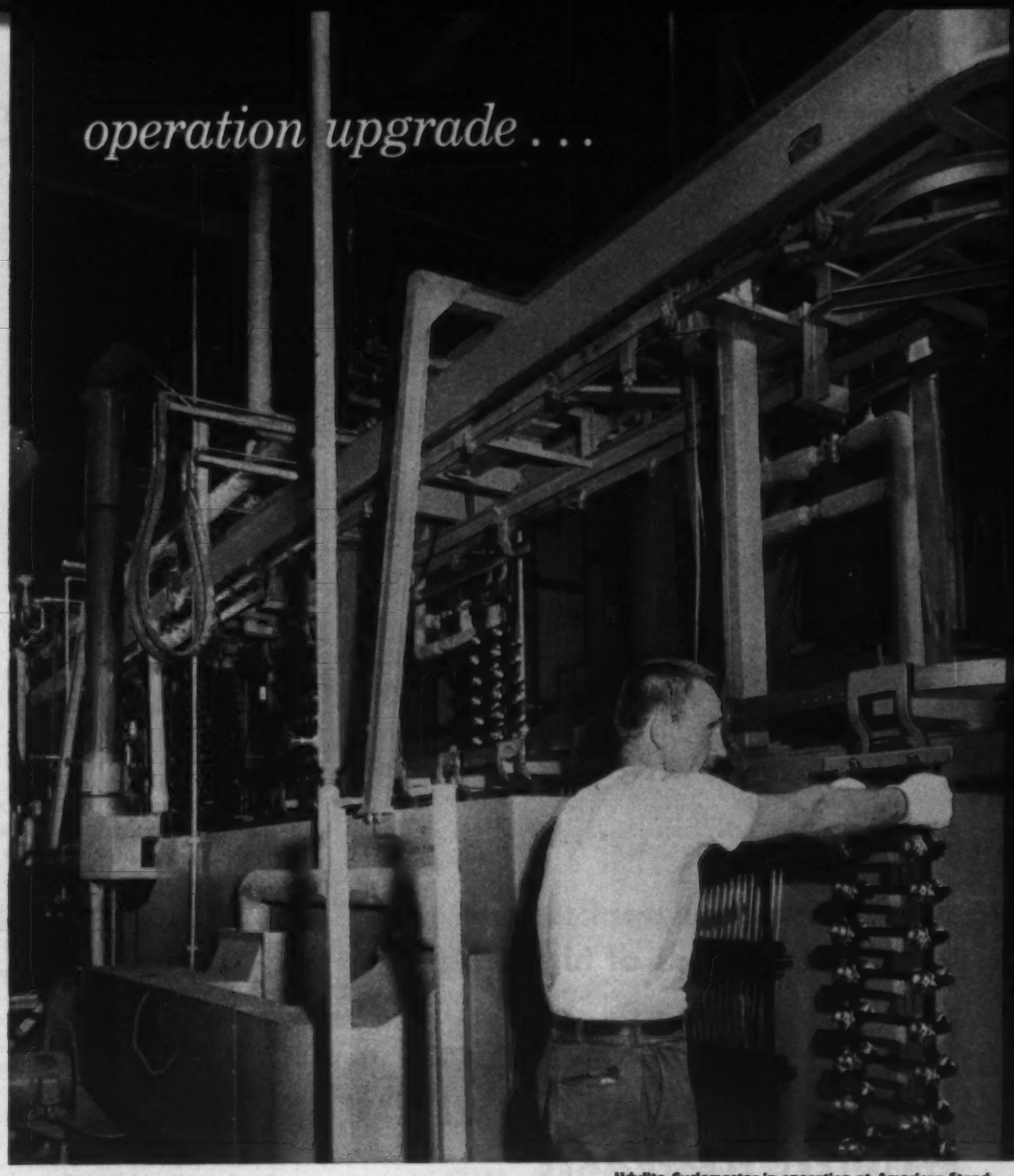
E. J. Kubis—Look for improved paint removers to be introduced in 1960.

New strippers of the activated alkaline type will be available for handling hooks and rejects in automotive and appliance plants using new highly resistant finishes. Also coming are better cold solvent type strippers for removing paints from aluminum and other metals not practical to strip in strongly alkaline mixtures.

Better finishes for aluminum are on the horizon. There will be improved cleaners for removing buffing compounds, simplified procedures for preparing aluminum for plating and advancement in bright dipping and anodizing to produce highly reflective finishes.

The chemical industry still has plenty of challenges and opportunities for those with knowhow and imagination. We need better finishes for magnesium, a metal

operation upgrade . . .



Udylite Cyclemaster in operation at American Standard Plumbing and Heating Division, Cincinnati, Ohio

CYCLEMASTER has the answer . . .

This Udylite Cyclemaster, which is another way to say low cost automation, represents six important areas of improvement in American Standard's plating production.

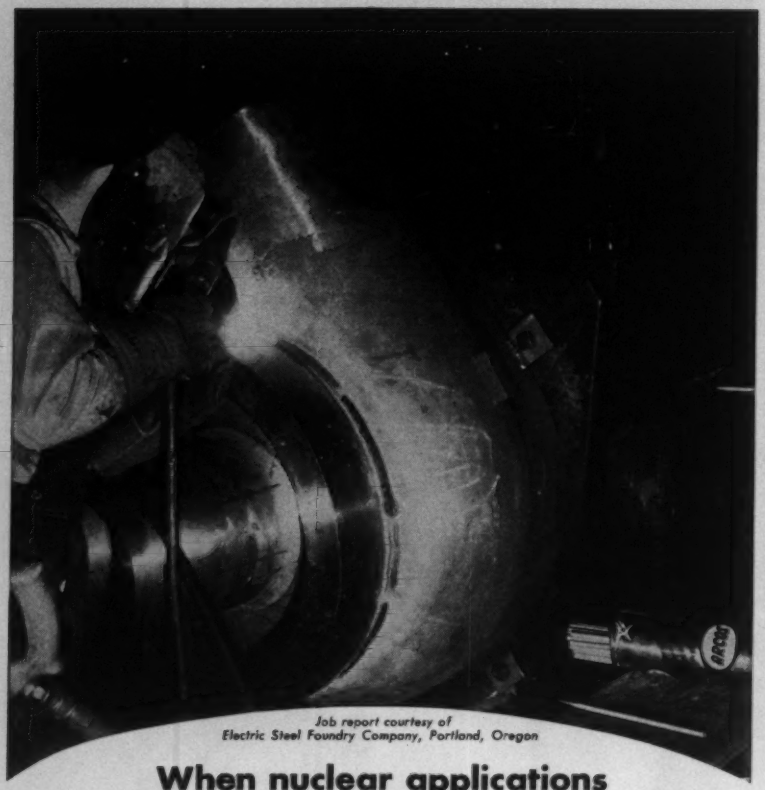
- quality control to meet their most exacting top standards
- production volume far exceeding their expectations
- nearly 50% savings in floor space used for the operation
- almost total elimination of rejected pieces
- ultra-sonic cleaning to eliminate complicated de-greasing
- Plastisol coated tanks for minimum maintenance . . . long life

Learn how Cyclemaster can perform with equally promising revisions of your profit picture while improving your product whatever it may be. To find out how so *much* can be accomplished for so *little*, ask your Udylite representative, today!

the udylite corporation

detroit 11, michigan • world's largest plating supplier

on the west coast: the L. H. Butcher Company



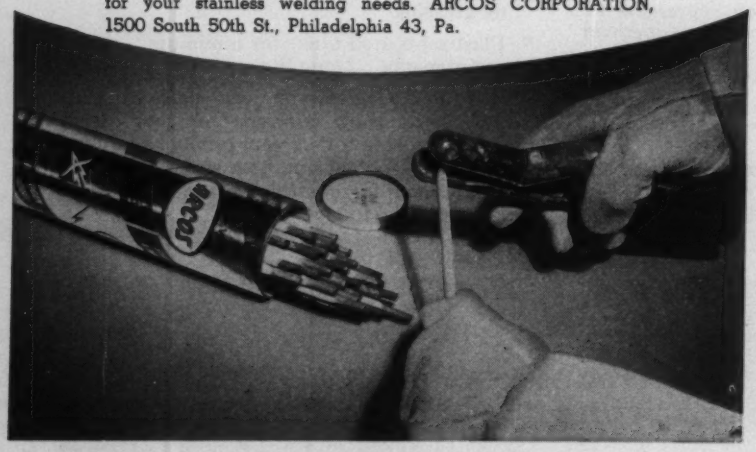
Job report courtesy of
Electric Steel Foundry Company, Portland, Oregon

When nuclear applications call for stainless welds of highest quality

WELD WITH ARCOS

STAINLESS ELECTRODES

This is part of a 3900 lb. stainless pump-volute casting for a submarine nuclear power plant. In the photo, a skirt is being welded to the casting using 5/32" dia. Arcos Chromend K Electrodes. To minimize stresses, a step-back and skip procedure was used. These welds conformed to Class I Navy radiographic standards—an indication of the dependability of standard Arcos electrodes for your stainless welding needs. ARCOS CORPORATION, 1500 South 50th St., Philadelphia 43, Pa.



Cleaning and Finishing

G. W. BALZ
President
Roto-Finish Co.
Kalamazoo, Mich.

with many desirable properties but poor corrosion resistance. We need better dyes and more resistant reflective aluminum finishes, particularly for exterior automotive trim.

We also need workable solutions to growing problems of chemical waste disposal. Cresylates, chromates, and cyanides, necessary components of many cleaning and finishing operations, are now practically prohibited in waste waters in many areas. Improved, less expensive waste disposal systems are needed especially for the smaller user.

Vibratory Finishing Will Replace Tumbling Barrels

Gunther Balz—Vibratory finishing, a process developed during the last year, will certainly have a tremendous impact on the industry in the year to come. The process is more than a logical development of conventional barrel finishing techniques; it is definitely a major breakthrough.

Because of the action produced in a conventional tumbling barrel, internal burrs or recessed surfaces receive little work. The vibratory process reaches the internal areas and works them at the same time. So it can be used to deburr complex castings economically without recourse to expensive hand operations.

Vibratory finishing will also compete in bulk processing smaller, less complex parts because the process can deburr up to ten times as fast (3 to 5 minute cycles are common) at roughly 20 per cent of the cost of a tumbling operation.

It becomes possible to consider setting up for in-line processing since vibratory finishing is carried out in open tanks.

Cleaning and Finishing

A. D. DUNCAN
Vice President
Glidden Co.
Cleveland

Continuous, conveyorized deburring operations can be tied in with conveyorized cleaning and surface treatment.

Water Based Paint Systems To Widen Commercial Uses

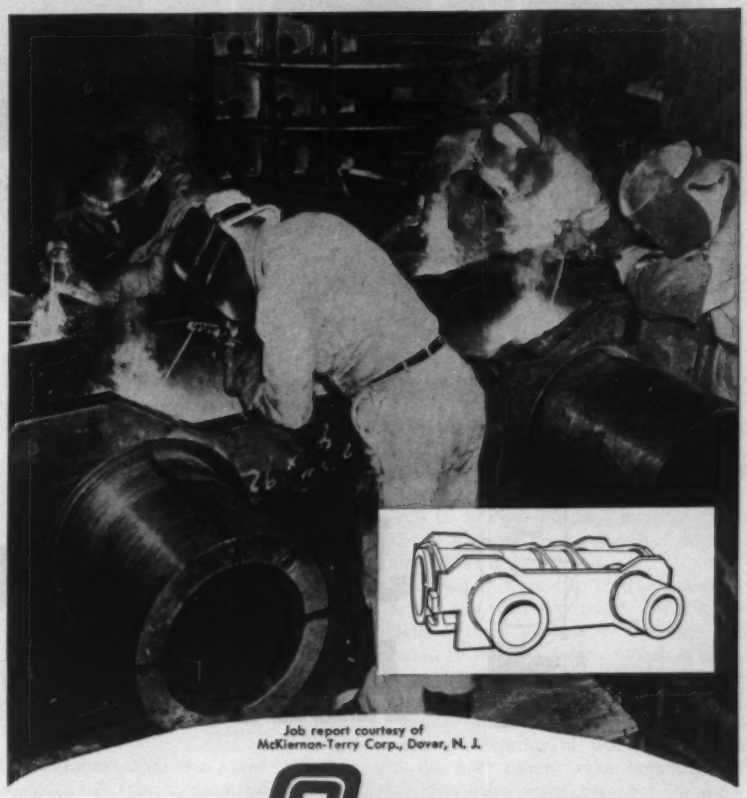
A. D. Duncan—Acrylic lacquers and water reducible coatings have been successfully used by the automotive industry; and thermosetting acrylic copolymer enamels are being used by the appliance industry. Application of the new organic coatings will surely expand into areas of the general fabricated metal products. The next logical progression will be water reducible primers, primer surfacers, and enamels for the 1961 automobiles and home appliances.

Acrylic and vinyl type plastic coatings have recently been introduced to the architect. A number of industrial buildings and skyscrapers use vinyl or acrylic finishes over stainless or galvanized steel. The more conventional high quality melamine, vinyl, and acrylic modified alkyds will also find increasing use in this field.

The industrial maintenance, marine, and transportation industries have become acutely aware of their tremendous losses in investment due to corrosion. Lengthy testing and evaluation of highly resistant coatings have been completed. These will become standards: Vinyl, vinyl alkyds, acrylics, epoxies, polyurethanes, polyesters, and latex coatings and linings.

Of considerable importance this year will be the use of spray applied polyurethane foam for insulation of steel tanks and chemical equipment in maintaining ambient temperatures for chemical processing.

When low alloy weld requirements are as *critical* as these

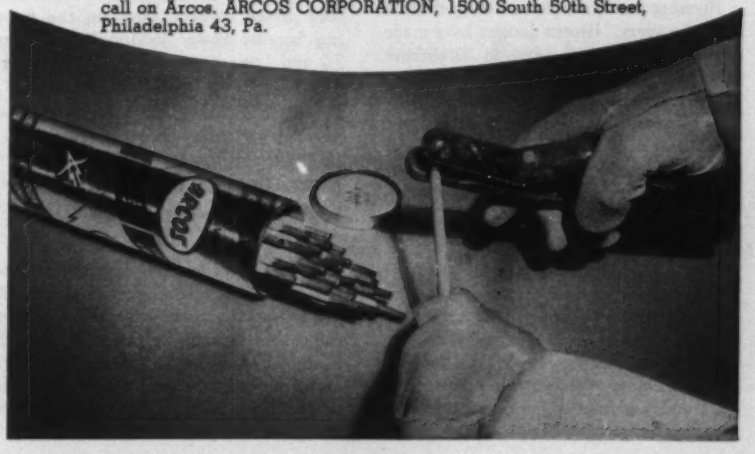


Job report courtesy of
McKiernan-Terry Corp., Dover, N. J.

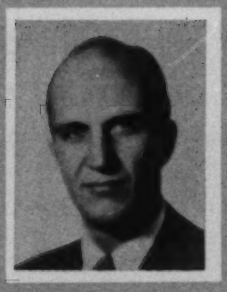
WELD WITH ARCOS

LOW HYDROGEN ELECTRODES

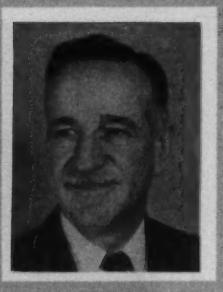
This crosshead weldment—part of a Navy steam catapult for launching jet fighters—must withstand the repeated powerful surges of steam under high pressure. Arcos Tensilend 80 electrodes were used to weld the SAE 4130 low alloy steel. After progressive magnaflux checking, and proper stress relieving, all welds were found to meet the high strength and toughness required for this kind of service. For the *right* weld metal—for the *right* welding techniques—for your tough welding problems—call on Arcos. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



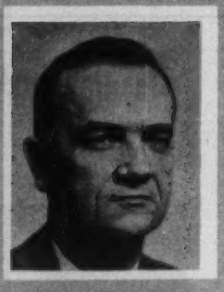
R. M. GORDON
Vice President, Sales
Milford Rivet & Machine Co.
Milford, Conn.



A. WATSON ARMOUR III
President
Huck Mfg. Co.
Chicago

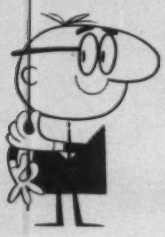


WILLIAM G. WALTERMIRE
Chief Product Engineer
Lamson & Sessions Co.
Cleveland



J. F. GALBRAITH
Development Manager, Electric Welding
Linde Co., a div. of Union Carbide Corp., New York

1960 FORUM ON TECHNICAL PROGRESS



Joining and Assembly

Looks for 10% Increase In 1960 Rivet Business

R. M. Gordon—We look for the semi-tubular rivet market to increase 10 per cent during the coming year. Reasons: The growth of our principal customers and simultaneous multiple riveting.

Rivets are required for everything from toys and novelties to missile components. As the demand for such products increases, rivets will also be used in greater numbers.

Riveting machines have changed little over the years. Recent designs have made multiple riveting possible in assemblies where it couldn't be done before. That has led to more automation which further lowers costs. In fastening methods, the final "in-place" cost is all important. We have been able to lower riveting costs substantially by concentrating on the application equipment.

Cold Fasteners Continue To Replace Hot Types

A. Watson Armour III—Watch for big strides in close-tolerance fastening in aircraft and adoption of new techniques in construction.

To get close tolerances, speed has been sacrificed. That adds to cost.

The first production applications of self-sizing, self-broaching Huckbolt fasteners were recently made. We expect broader uses this year.

Construction people are also studying the possibilities of $\frac{5}{8}$ and $\frac{3}{4}$ in. diameter Huckbolt fasteners. They can be used in place of hot rivets on a size-for-size basis.

Although $\frac{5}{8}$ in. diameter fasteners are small by construction standards, they are a means for becoming acquainted with the cold driven concept. Now on the drawing boards: Power tooling for handling $\frac{7}{8}$ and 1 in. diameter Huckbolt fasteners. When they are available, we predict a re-evaluation of fastening procedures.

More Impact Extruded Fasteners Being Made

William G. Waltermire—Impact extrusion, hot and cold, is coming into increasing use in making parts originally machined from bars, tubing, forgings, or castings. Examples: Auto engine wristpins are cold extruded; tapered cone nuts are hot extruded. Both are more accurate and cost less than their predecessors.

New high alloy steels and stainless types 303, 304, 305, and 400 are rapidly growing too.

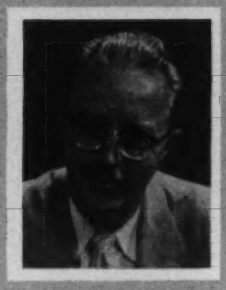
More firms are requiring that parts be made to greater accuracy and higher strengths. Reason for the demand is the trend to automatic assembly. Failure of any one part to feed can jam or break the assembly devices and stop a line. Tolerances must be closely held on each part.

The trend to hexagon bolts and nuts with an identical "across flats" dimension is progressing rapidly.

Bridge and building construction people continue to increase usage of high strength bolting and high strength bearing bolts, made of medium carbon steel, heat treated to ASTM A-325 physical properties. Such joints are easy to inspect and provide high strength at relatively low assembled cost.

Short Arc Considered Biggest Welding Advance

J. F. Galbraith—Much wider usage, both manually and mechanized, is predicted in 1960 for the short arc process. As expected, it has proved to be one of the



W. C. POTTHOFF
Vice President
Aeroprojects Inc.
West Chester, Pa.

R. L. PEASLEE
Vice President
Stainless Processing Div., Wall Colmonoy Corp., Detroit

E. S. TWINING JR.
Vice President, Marketing
Air Reduction Sales Co., a div. of Air Reduction Co. Inc., New York

E. F. HESS
Product Manager, Adhesives, Coatings & Sealers Div., Minnesota Mining & Mfg. Co., St. Paul

year's biggest advances. It produces high quality welds in a wide variety of metals. It can be used on 0.020 in. or on ¼ in. material. The technique can be quickly and easily learned.

The plasma arc has reached the application stage: Possibilities include hard facing and cutting up to 2 in. stainless and 4 in. aluminum. The next phase: Removal of large volumes of metal.

Mechanized welding will continue to move ahead—aluminum pipe up to 8 in. in diameter is a forerunner of similar operations on other materials. Inside-out welding of missile components and other cylindrical shapes is a novel and superior approach.

Fast Ultrasonic Welds Will Benefit Packagers

W. C. Potthoff—Ultrasonic welding has entered the production phase. The next few years will see it recognized as an important production tool in many new areas of metal joining.

The method will soon be used on atomic fuel elements. Special equipment may reduce the cost of fuel elements in power reactors.

Equipment designs and tooling problems are still under intensive development. Six sizes of spot-type welders (from 25 watts to 4000 watts) are commercially available. Lower and higher powered machines are coming.

In aluminum fabrication, ultrasonic welding is being used to splice aluminum foil and attach copper terminals to aluminum foil and sheet conductors.

Low power requirements make the method attractive for aluminum structures. Portable, high powered equipment will soon be available for aircraft and automotive applications.

Continuous seamwelds that form hermetic seals with aluminum foil (packaging) have been made at more than 1000 inches per minute. Higher powered equipment, presently under development, indicates speeds four to six times faster.

The ability to weld dissimilar materials in multilayers is an important factor in the design of many high strength, lightweight structures.

The sealing of semiconductor housings by a new design, ring type welder has been proved in the laboratory and will soon be in pilot-plant operation.

Aircraft Brazing Will Spread To Commercial Applications

R. L. Peaslee—The year ahead will see broad diversification by processors of stainless aircraft and atomic energy products. Main fields: Automotive, dairy, and consumer goods like tableware.

Expansion in the field of reactors, core fuel elements, and instrumentation will mean more business for those technically equipped to braze stainless steels and high alloy base metals.

Heating of brazed assemblies should make significant progress during the next few years. Blanket heaters, pyroforic coatings, luminous wall furnaces, and quartz tube heaters are some of the more promising methods. They are being applied to honeycomb brazing, but as technology improves, we expect to see them used in other commercial fields.

Brazing for high temperature service still faces an educational hurdle.

A real need is being met by the brazing and soldering committee, American Welding Society. Its study of a standard test specimen will provide positive basis for comparing brazed joint strength.

Electron Beam Welding May Lick Tough Problems

E. S. Twining Jr.—Electron beam welding holds promise of overcoming difficulties encountered with: 1. Titanium, molybdenum, tantalum, and zirconium in critical atomic and nuclear applications. 2. High precision light gage weldments.

Ultrasonic welding is being studied intently. It may solve many of the problems in welding thin gage material. Also, it will undoubtedly be developed to handle thicker gages.

Brazing will grow in 1960—particularly brazed honeycomb structures. Much larger sections than those now used are expected in the near future. Work is being done on brazed joints for continuous exposure to 1000° F and higher.

Several long range projects will come under the scrutiny of welding engineers in the near future. The improvements are designed to meet the need for automation in production, particularly in high speed aircraft and space vehicles.

New controls will be developed to make an arc follow a seam exactly, no matter how oriented in space. They will also control needed variations of welding power.

Remotely controlled cutting machines larger than those in use will be developed.

The handling of large weldments will become easier—new procedures will allow high deposition rates regardless of joint position.

Coming: More Adhesive Bonded Metal Structures

E. F. Hess—Joining load bearing structures with high strength adhesives will have a great impact on the metalworking industry in the next few years.

The reason: Newer and stronger adhesives have greater high temperature resistance and better curing characteristics.

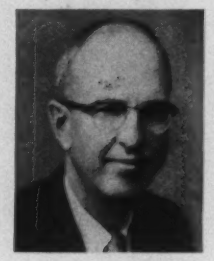
Following aircraft's lead, general metalworking assembles many small parts with structural adhesives. We look for the practice to be extended to larger and more complex parts.

Manufacturers of curtain wall building panels, office partitions, garage doors,

Joining and Assembly

FRED L. PLUMMER
National Secretary
American Welding Society
New York

EDWARD J. MORRISSEY
President
Chicago Rivet & Machine Co.
Bellwood, Ill.



R. DAVID THOMAS JR.
President
Arcos Corp.
Philadelphia

JOHN J. CHYLE
Director of Welding Research
A. O. Smith Corp.
Milwaukee

metal shipping containers, pneumatic tools, pumps, motors, and scaffolding have adapted that concept to their production lines.

The most promising structural materials are the high strength thermosetting film adhesives and the one-part modified epoxies.

Thermosetting film types are easy to apply, provide uniform thickness throughout the joint, can be confined to the bonding area, and are clean bonding.

One-part modified epoxies have a built-in latent catalyst which eliminates weighing and mixing and possible human error. They do not require pressure and have void filling properties which make them particularly useful for joining loose-fitting parts. Excellent self-filleting properties make them good for honeycomb sandwich construction.

Todays' adhesive strengths are adequate; missiles need adhesives with more strength at high temperatures.

Lists Seven Methods Likely to Gain Stature

Fred L. Plummer—The most important advances during 1960 will probably result from the broader application of inert gas, shielded metal and tungsten arcwelding, and some of the newer developments in brazing and resistance welding.

Probably the most important technological problem: The training of engineers to design parts and assemblies to take full advantage of welded machines and structures.

These joining methods will become more important: Electron beam welding for joining refractory metals, high thermal conductivity metals, and highly reactive metals; ultrasonic welding for beryllium and molybdenum and dissimilar metal combinations; electroslag welding for heavy sections; vacuum brazing for heat extractive bimetals (thick-copper-to-thin tantalum in missiles); plasma torch for high temperature reactive metals, difficult cutting problems, metallizing, spraying and, possibly, some fusion welding; explosive welding (still being studied); and welding with certain rocket fuels which can fuse metals.

We look for a better understanding of the basic metallurgy of joining through increased research.

Tubular Rivet Growth Tied to New Equipment

Edward J. Morrissey—Rapid industrial growth and a widely expanding market for consumer goods have promoted wide acceptance of tubular rivets for joining assemblies of different materials.

The growth has been enhanced by a wide range of rivet dimensions and lengths, and the advent of better automatic rivet setting equipment.

At first, such equipment was limited. Today, tubular rivets are popular and widely accepted. Flexible multiple unit equipment meets high speed production and automation requirements.

Rivet sizes now range from 1/32 in. body diameter to 7/16 in.; lengths go up to 3 in.

Machine developments include multiple setting equipment, quick change tools for interchanging sizes, quick change centers, index tables, sliding fixtures, rotating fixtures, and adaptability of such equipment.

Continued research and experiments will bring an even wider range of sizes and applications.

Electroslag to Cut Cost Of Heavy Weldments

R. David Thomas Jr.—In the next two to three years, the electroslag welding process will bring important savings to fabricators using submerged arcwelding to join steel plates 2 in. or more thick.

The steel joint is placed vertically, and the welding machine makes the entire joint in a single operation.

The method is an outgrowth of slag shielded and gas shielded arcwelding. The two protecting media will continue to enjoy a steady growth in both automatic and semiautomatic welding. The advantages of employing both slag and gas in arcwelding are becoming increasingly evident. They should find an increasing number of users during the 1960s.

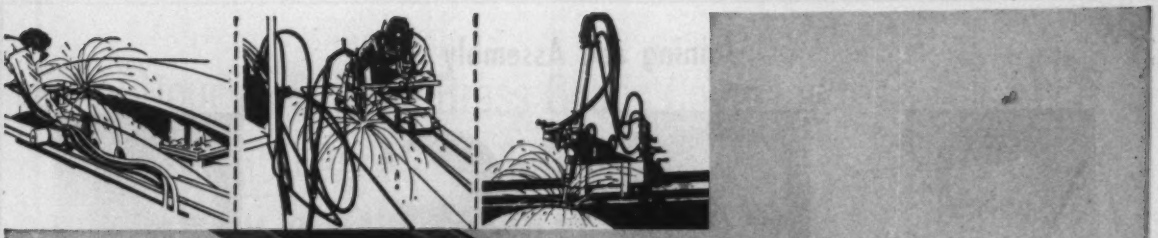
Through its research, welding is bound to see some remarkable improvements in the next three years.

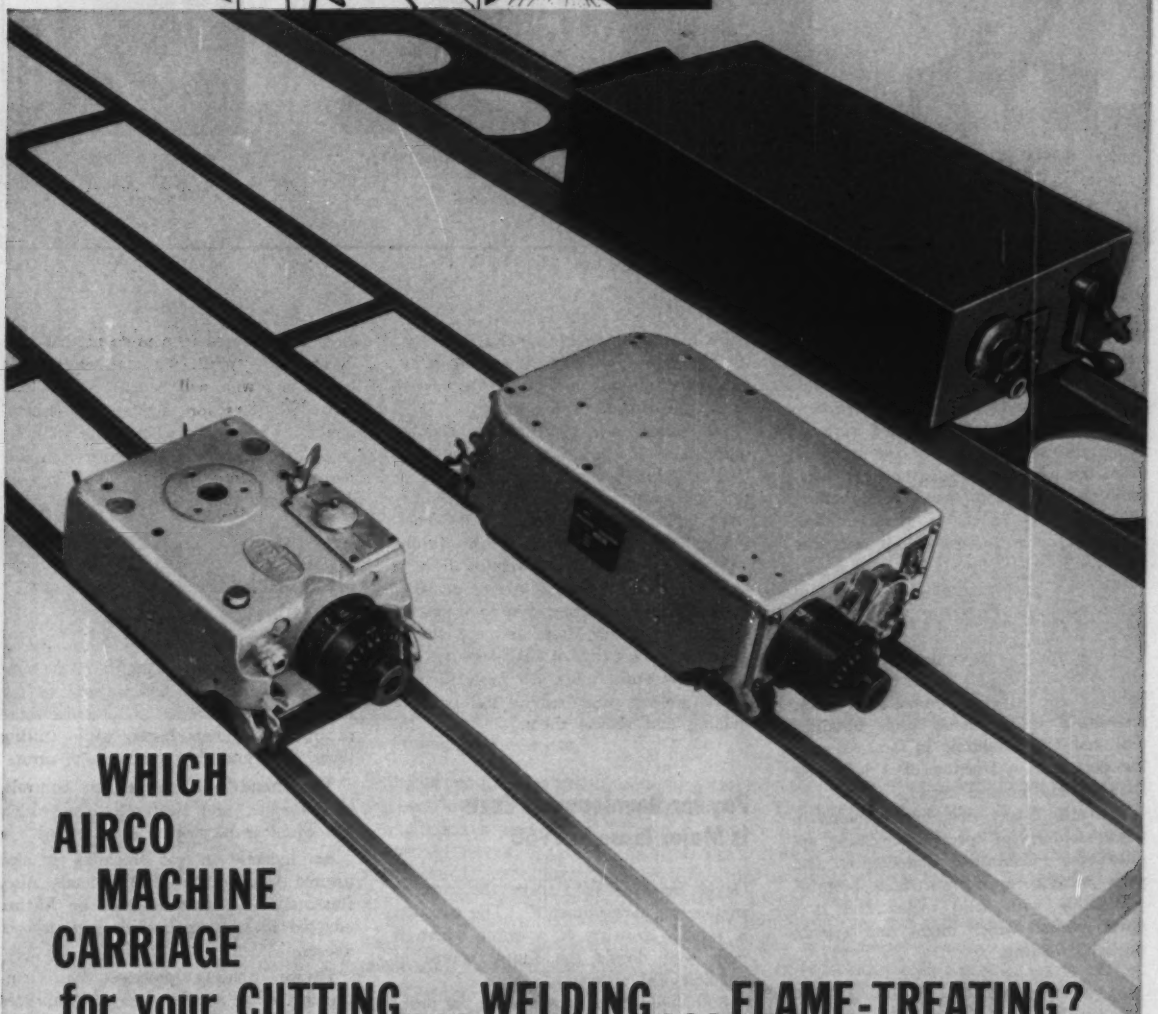
CO_2 Diffusion Bondwelding Cited for Future Potential

John J. Chyle—CO_2 welding has proved itself in high and low speed production. Use of the method is expanding rapidly.

Buttonwelding is an outgrowth of CO_2. (It puts a small button through two solid sheets of material automatically.) It will probably gain wider acceptance for replacing older fastening methods as industry continues its evaluation.

Automatic arcwelding speeds are so great (often four times the old rate) that manual or machine guidance is no longer adequate. Several methods of automatic guidance have been developed: One is based on the voltage drop between





WHICH AIRCO MACHINE CARRIAGE for your CUTTING . . . WELDING . . . FLAME-TREATING?

If you use machine carriages you know this: You need the best carriages to do the best work.

For that reason Airco produces these motor-driven and portable Radiagraphs . . . track or contour guided. The No. 41 is designed particularly for the heavyweight jobs; speed range: 1½ to 72 ipm. The No. 20 is a natural for the jobs involving medium-to-heavy cutting and welding equipment; speed range: 2 to 240 ipm. The No. 10 type is built to breeze through the lighter gauge jobs, speed range: 2 to 50 ipm.

Fingertip speed control allows an infinite selection over the entire speed range. Easy-to-attach accessories equip them for arcs, circles, ovals, and many other applications.

At least one of the Airco Radiagraphs will handle your toughest jobs. For catalogs on all, send your name on your letterhead. Do it now.

AIRCO®

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated

150 East 42nd Street, New York 17, N. Y.

Offices and authorized dealers in most principal cities

On the west coast—
Air Reduction Pacific Company

Internationally—
Airco Company International

In Cuba—
Cuban Air Products Corporation

In Canada—
Air Reduction Canada Limited

All divisions or subsidiaries of Air Reduction Company, Inc.

Joining and Assembly

ROBERT A. WILSON
Vice President
Lincoln Electric Co.
Cleveland

DAVID SCIAKY
President
Sciaky Bros. Inc.
Chicago

A. F. CHOUINARD
Director, Research & Development
National Cylinder Gas Div.
Chemetron Corp., Chicago

RICHARD C. LIPPS
Manager, Welding Dept.
Westinghouse Electric Corp.
Buffalo

the electrode and the work; another has a sensing device with a stored memory equipment; a third is purely mechanical.

Diffusion bondwelding is another new process. It depends on plated surfaces which diffuse and join at the interface when the parts are pressed together. Dissimilar metals and some combinations of refractories (such as titanium and zirconium) are successfully joined that way.

We also expect more will be heard about explosion welding in the near future.

In resistance welding, the magnetic force type has found a place and is expanding. So is percussion welding. Some interesting results have been obtained with half-cycle welding; in fact, reducing the period to a fraction of a half-cycle shows some marked effects.

We also expect new developments in power sources for special arcwelding applications. Controlled inductances and peak currents appear to show promise.

Welding with solid rocket fuel is a novel method which might find a place in field welding.

Trend to Mechanized Welding Is Expected to Continue

Robert A. Wilson—Welding has won acceptance wherever metals are joined. Our next challenge is to broaden its use, making it more efficient.

Mechanization is one important opportunity for increasing efficiency. When an operation is even partly controlled by machine, welding costs are reduced and the consistency of quality improved.

Mechanization is already being applied to many jobs usually thought possible only with conventional hand electrodes. The next few years will see that trend accelerate. It will include a normal increase in full automatic applications, but the big change will be to the use of semiautomatic systems on short welds, curved welds, and out-of-position work.

We believe our approach is basically sound and in line with that trend: It uses a tubular electrode containing all the necessary ingredients for shielding, slagging, alloying, and oxidizing the weld.

The dominant process of the future will feature: Continuous welding from a large reel; a visible arc; little or no slag; no external gas or flux; minimum spatter to reduce cleaning time; and the ability to use high currents at high speeds.

Manufacturers must continue to improve welders and reduce the cost of making and selling them.

Pay for Development Costs Is Major Issue in 1960

David Sciaky—"Who pays the cost of engineering development?" The question is rapidly growing to a point where it may well decide the future course of technological progress.

Both builder and buyer share the problem equally. The builder gambles when his proposal is to be judged primarily on price and delivery. The buyer gambles when he orders equipment from someone who can't afford to gamble. Such a system affects the profits of both. The technology of manufacturing is already the biggest loser.

I believe responsibility is the key that will solve the problem. The buyer must demand that the machine builder be responsible for seeing to it that his concept will do the job. The machine builder must extend that responsibility to deliver the performance he promises. And most important, the builder must be paid for his responsibility.

The buyer's return on his investment must be measured in equipment that produces greater profit with less effort. He is the one who will benefit in the long run. He pays for engineering development in proposals whether or not he buys the machine. The buyer gets his return by owning equipment which produces greater profit with less effort.

Fluxcored CO_2 Spurs Joint Design Advances

A. F. Chouinard—Automation is a necessary and inevitable advancement to the fabricator who wants to produce more accurate weldments faster, while cutting labor costs and the possibility of error.

That trend will require new controls, new torches, and new electrodes which can equal or surpass those of today.

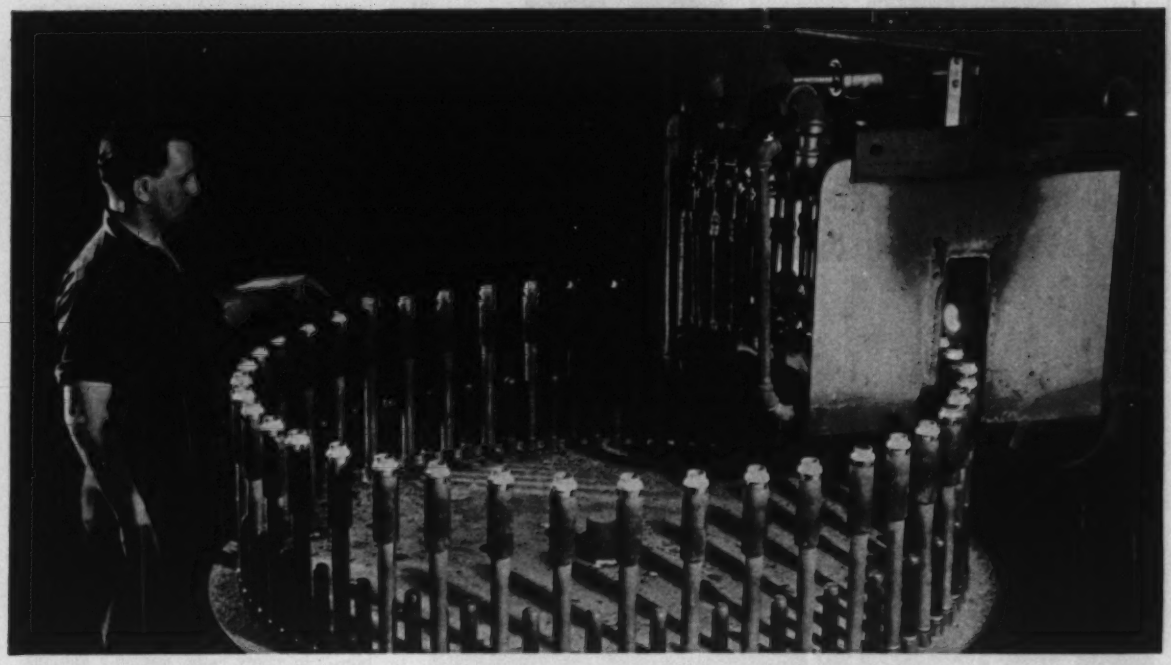
An increase in gas shielding is also assured. One reason: Exotic metals. Also, fluxcored CO_2 welding will be further adapted to new steels with high impact values.

Future welding processes can conceivably make possible new and improved joint designs—one has already been developed which capitalizes on the deep penetration of the fluxcored CO_2 process. Its deep penetration with small leg length of the fillet provides joint strength equal to conventional types, yet needs only 70 per cent as much electrode.

Timed Controls, Arc-Spot, Burn-Through to Gain

Richard C. Lipps—We look for major advances in the design and use of automatic and semiautomatic Mig processes. Arc-spot and burn-through welding equipment and timed controls will make major

Every Hour M. S. Little Brass Goods Company Makes 650 Appliance Fittings Better With HANDY & HARMAN SILVER BRAZING



Rotating jig showing mounted assemblies entering and leaving gas-air furnace.

Left– brazed assembly. Right– components with preform ring of EASY-FLO *45.*

This Hartford, Connecticut, company makes—in volume—an assembly that goes into the overflow system of household appliances. The assembly consists of brass tubing and a machined brass casting. The two components are joined by a preplaced ring of Handy & Harman EASY-FLO 45 silver brazing alloy and HANDY FLUX. Heating is automatic gas-air; parts are placed on a rotating turntable to pass through the gas furnace. Every 60 working minutes, 650 assemblies are completed.

The advantages here are that the manufacturer can use thin-walled tubing with heavier, threaded components at no sacrifice in strength. Because of EASY-FLO's penetrating qualities, the entire shear area is fully as strong as the solid parts of the assembly, yet considerably lighter. And, casting and machining the components for this assembly have been greatly simplified.

Are you in pursuit of a metal-joining method which offers—among other advantages—high, uninterrupted production at low capital investment? You may easily find the answer in Handy & Harman silver brazing. Hundreds of manufacturers and fabricators of as many different products, parts and components are right now enjoying the speed, economy, strength and *flawlessness* of brazing. You can too. Just ask Handy & Harman, 82 Fulton Street, New York 38, N. Y.

COMING IN NOVEMBER!

New Handy & Harman Brazing Correspondence Course. Simple self-study data on all phases of brazing. Send for details to Dept. BC.

FOR A GOOD START: BULLETIN 20

This informative booklet gives a good picture of silver brazing and its benefits... includes details on alloys, heating methods, joint design and production techniques. Write for your copy.

Your No. 1 Source of Supply and Authority on Brazing Alloys

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

DISTRIBUTORS IN PRINCIPAL CITIES

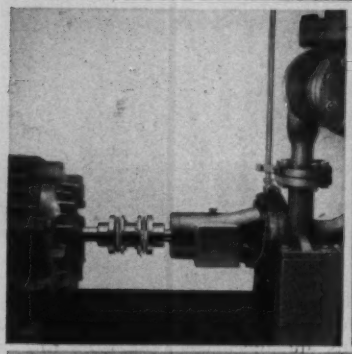
Offices and Plants
Bridgeport, Conn.
Chicago, Ill.
Cleveland, Ohio
Dallas, Texas
Detroit, Mich.
Los Angeles, Calif.
New York, N. Y.
Providence, R. I.
San Francisco, Calif.
Montreal, Canada
Toronto, Canada

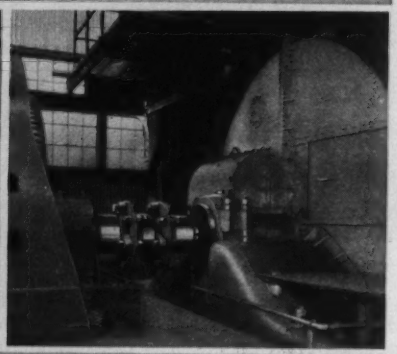
Joining and Assembly

LAURENCE H. FLORA
Director of Sales
Tinnerman Products Inc.
Cleveland

ROBERT C. SINGLETON
Vice President, Engineering
Gregory Industries Inc.
Lorain, Ohio

Protect your PUMPS and other Indispensable MACHINERY with THOMAS FLEXIBLE COUPLINGS





NO LUBRICATION NO MAINTENANCE NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES:

- Freedom from Backlash
- Torsional Rigidity
- Free End Float
- Smooth Continuous Drive with Constant Rotational Velocity
- Visual Inspection While in Operation
- Original Balance for Life
- No Lubrication
- No Wearing Parts
- No Maintenance

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

advances because of lower initial costs and flexibility.

Improved power sources, torches, guns, and monitoring equipment will extend the useful range into new fields. We also see advances in continuous welding wires. Flux coating of continuous spooled and barreled wires offers many possibilities for improvement in deposited metal characteristics.

Electron beam welding and other special processes in vacuum chambers will advance the joining of the more "exotic" metals required for atomic energy and Space Age programs.

High temperature welding, cutting, and spray-coating with plasma jets may have an important effect in the coming year, but industry adoption may take longer. Photoelectric line scanning and steering devices for automated cutting equipment will find new levels of acceptance. The fastening of studs by timed welding controls will grow.

Management will take a new look at arcwelding as a means of fabricating finished products. The use of manual machines and stick flux coated electrodes will increase, but semiautomatic means will grow faster.

Better procedures and filler metals will be developed for joining high strength steels and other special alloys.

More Standard Fasteners To Aid Assembly Designer

Laurence H. Flora—It is evident that 1960 will see more manufacturers specifying spring steel fasteners for major assemblies. In many cases, assembly and material handling time will be reduced 50 per cent with engineered fasteners.

We are becoming more aware of the aids which engineers and fabricators need for planning. We expect to have a greater variety of standard spring steel fasteners to satisfy the needs of those who must consider techniques while the product is on the drawing boards. At that point, qualified fastening engineers should be consulted to solve line balance and flow problems.

New Tools Broaden Studwelding Horizons

Robert C. Singleton—Pressure to cut costs and improve quality will become more intense than ever, bringing the most vital and significant years in studwelding history. Entirely new studwelding guns, equipment, and power sources will provide a springboard into new marketing areas. The light gage metals are a challenge for some special equipment. Both condenser discharge and arc techniques will advance the attachment of mechanical fasteners in many areas not previously considered practical.

Other major advances have made it

practical to weld 1¼ in. studs. Portable equipment can handle ⅞ in. sizes.

Aluminum must be placed near the top when considering market potentials. Factors which benefit steel users are even more beneficial to aluminum fabricators. Attachment speed, weight reduction, simplification of design and freedom from leaks are even more important in aluminum fabrication because of material costs. Aluminum studs up to ½ in. are presently available.

Rivet People Awake to Need For Complete Fastener Package

Ralph S. Battles—Never before have manufacturers been so desperate for increased production at lower costs. Demands for immediate delivery are increasing.

Such factors can be combated by advances in the automatic rivet setting machine. Increased interest in automatic assembly techniques has led to a "rediscovery" of riveting.

That means more and more pressure on rivet manufacturers. We look for faster, more efficent machines this year. We will improve our production to build inventories and meet an expected increase in demand for off-the-shelf deliveries.

We note that industry no longer buys the rivet alone. Is is more concerned with fastening rather than the fastener. To comply, we feel fastener people must supply a complete package . . . engineering, method, automatic machine, and the rivet itself. We must design rivets to do jobs never before conceived in entirely new materials.

Mechanical Reliability Is Big Challenge of '60s

J. V. Lester—We look for more imaginative applications of present techniques and materials and rapid development of exotic metals.

This decade has a challenge left over from the fifties—mechanical reliability. There is nothing more useless and costly than an expensive machine tool logging downtime, a plane in the hangar due to mechanical failure, a satellite that nearly attains orbit.

To keep a step ahead of the reliability requirements of tomorrow demands extensive research efforts teamed with precision production.

Successful developments of titanium fasteners preceded today's work with beryllium. That metal shows promise due to its extreme lightness. While still expensive, its strength-weight ratio is nearly five times that of steel. In our beryllium research facility, we are determining tensile strength, fatigue life, and machinability properties to equate them with raw material costs.

Joining and Assembly

RALPH S. BATTLES
President
Judson L. Thomson Mfg. Co.
Waltham, Mass.

J. V. LESTER
Vice President
Standard Pressed Steel Co.
Jenkintown, Pa.

WAPAK SLITTERS

Photo courtesy of Stamco Inc., New Bremen, Ohio

SINCE 1891

Mirror Finish and ULTRA-KEEN EDGES reflect LOWER PRODUCTION COSTS

Longer continuous runs with less down-time are obtained with WAPAK Slitters and Rotary Shear Knives, because they're designed for high-speed cutting and trimming. Precision inspected by visual gage and profilometer.

Wapakoneta, one of the oldest and largest machine knife manufacturers in America, assures you of the exact heat treatment and grinding specified for your needs. Thickness and parallelism tolerances of .0002 or closer if required.

Use WAPAK MULTICUT for maximum production. WAPAK TUFCUT is engineered for shock-resistant cutting of heavy stock.

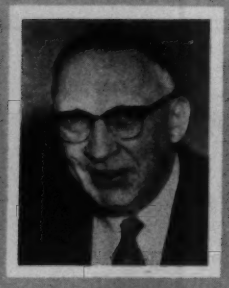
Export Div.: 30 Church St. New York 7, New York

WAPAK KNIVES

THE WAPAKONETA MACHINE CO., WAPAKONETA 10, OHIO

Knives Engineered for the Job Since 1891

SLITTER KNIVES • SHEAR BLADES • SCRAP CHOPPERS • HARDENED SPACERS • GIBS • HARDENED WAYS • ROCKER PLATES • WEARING PLATES • MACHINE LINERS



W. A. MEDDICK
President & General Manager
Elwell-Parker Electric Co.
Cleveland

EUGENE CALDWELL
President, Material Handling Institute Inc.
General Manager, Baker Industrial
Trucks Div., Otis Elevator Co.
Cleveland

EDWARD W. McCAUL
Vice President, Sales
Jervis B. Webb Co.
Detroit

L. WEST SHEA
Managing Director, Material Handling
Institute Inc.
Executive Secretary, Industrial
Truck Assn., Pittsburgh

1960 FORUM ON TECHNICAL PROGRESS

Handling and Packaging

Automated Industrial Trucks Will Reduce Handling Costs

W. A. Meddick—Technical advances in material handling equipment during the next decade will include development of machines unthought of today. Example: Industrial trucks will run through routine jobs automatically, receiving orders from a prerecorded magnetic tape. Other types of material handling equipment will also be automated.

In the more immediate future, industrial trucks will be smaller. But they will be able to handle far greater payloads than today's models. They'll have smoother controls and be more maneuverable, so they can spot loads more accurately and work in more congested quarters. They will be able to travel faster and stay on the job longer, reducing material handling costs.

Material Handling Industry Expects Better Business

Eugene Caldwell—Makers of industrial material handling equipment may not see sales increases in the first part of 1960, but business should be good in the last half. A recent survey of MHI members indicates business volume in '60 will be 15 to 25 per cent above what it was in 1959.

Labor and material costs will probably increase in 1960. Industry will try to offset the increases by installing improved handling systems. Technological advances in equipment will spur industry to upgrade its handling program, so it can increase profits and reduce production costs.

Replacement sales should be about the same or slightly higher than they were in 1959.

Building Plans Modernized By Experts and Automation

Edward W. McCaul—Two trends are growing: Manufacturers are consulting material handling experts before they build factories and warehouses; and they're relying more on memory devices to guide handling equipment.

They realize that adoption of properly planned and integrated systems is one of the few ways left to increase output per manhour. Planners of new facilities spend weeks studying modern material handling systems used by other companies, to learn more about the latest methods and equipment design.

Automatic handling systems are designed along with processing equipment; the supplier and user decide on systems and procedures to be used before the cornerstone is laid.

When buildings are finished, material handling systems are already installed.

Operations are automated as much as possible. Memory devices, long used in data processing, are making their way into the conveyor industry. Current applications: Automatic sequencing of conveyors in the pulp and paper industry, warehousing industry, postal facilities, and in the metalworking industries.

Electronic Controls to Gain In Material Handling Field

L. West Shea—Metalworking plants will benefit in 1960 from the application of electronic equipment to material handling systems. Makers of overhead systems based on the conveyor and monorail will offer their customers more automatic controls than they're able to get at present.

A lot of automation is ready for the customer's order—in overhead and floor level

W. SHERIDAN HUSS
President
Acme Steel Products Div.
Acme Steel Co.
Chicago

JOE H. PERITZ
Executive Secretary, Hoist Manufacturers Assn. Inc.
Executive Secretary, Electric Overhead Crane Institute Inc.
Washington

O. H. McCLEARY
President
Mathews Conveyor Co.
Ellwood City, Pa.

R. C. SOLLENBERGER
Executive Vice President
Conveyor Equipment Manufacturers Assn.
Washington

systems. Example: Equipment makers can build automated warehouses when the customer is ready to pay for them. Next step: The customer takes advantage of the maker's ability to produce.

Industrial management is familiar with mechanical and manual regulation. The systems work well, and managers are reluctant to part with them. The cost angle is also important. As in many electronic applications, first cost is high. But it is more than made up in savings when the plant or warehouse uses automatic control systems.

This year's overhead systems and power lift trucks will handle heavier, bulkier loads than ever. Trucks will be equipped with attachments for tilting, turning, or rolling materials; for picking up and setting down round or smooth objects; and for stowing loads on racks or in highway trucks.

Steel Strapping to Gain In Coming Building Boom

W. Sheridan Huss—The nation will have its biggest boom in new plant construction in the sixties. Architecture and engineering of the plants will reflect the need to make maximum use of centralized steel strapping and other material handling economies.

As the production rate increases, new and more efficient steel strapping equipment will be developed for industry. Manual tools will be replaced by power tools and automatic steel strapping machines wherever practical.

In the last decade, high speed, automatic steel strapping equipment proved that it could reduce costs and eliminate bottlenecks by updating packaging and material handling methods. And management has shown it is willing to spend the money required to integrate centralized strapping equipment into fast moving shipping, packaging, and production assembly lines.

Unitizing, or the combination of many units into one master package, will continue to gain popularity. It will make for more efficient in-plant handling, storage, and shipping.

Crane and Hoist Industries To Meet Demands of Sixties

Joe H. Peritz—Many companies will be forced to expand or modernize their plants and adopt more efficient equipment during the sixties. Mechanization and automation programs may be delayed, but they cannot be canceled.

All modernization plans will include cranes and hoists as fundamental production tools. And great cost savings can be realized from carefully planned overhead material handling equipment; staggering building costs put a premium on every square foot of floor area, so all available air space must be used.

Because of new methods, materials, and processes, crane and hoist manufacturers must adapt their application techniques to meet changing field requirements. They must also adopt the latest technological improvements in the development and manufacture of their products.

Weight and size of components will be reduced to maintain or increase unit efficiency. And more compact units, running at higher speeds with more positive, more sensitive controls, will permit programed operation.

Conveyor Manufacturers Expect Boom in '60

O. H. McCleary—Conveyor manufacturers, those who design and build equipment for the metalworking industries, should have a good year. Plans have already been announced for substantial capital expenditures in those industries. Still more capital spending should be well underway early this year. But no useful estimate of 1960 business activity can be made without assuming that the steel strike can be settled during the injunction period.

Metalworking management will continue to cut costs wherever possible. The recession of 1958 made it clear to the manufacturer that he must cut production costs or lose his ability to compete for business in the markets he serves. Competition developed a sharp edge during the recession; the condition has since been emphasized by severe purchasing policies in the metalworking industries.

The emphasis on economy and efficiency will continue to grow in the next decade; automation will become more commonplace. To the conveyor manufacturer, the trend is significant. He will be called on to develop conveyor systems that will handle materials in process faster than the present ones. Newer, better processing machinery will require improved conveying equipment. Emphasis will be placed on automatic controls and special electrical or mechanical features.

Smaller, Stronger Conveyors Designed for Variety of Jobs

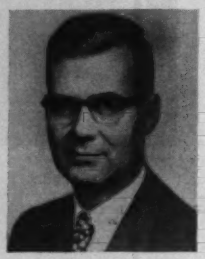
R. C. Sollenberger—Development and improvement of conveyors and components will continue in 1960. Load carrying elements will take greater stress and increased loads; driving elements will be smaller, but more powerful than today's models.

The expected wave of technical obsolescence in material handling equipment has been delayed, but the potential still exists.

New products, new processes, and expansion of production facilities will increase capital goods sales.

Improved mass transportation systems are needed to relieve urban congestion. Passenger and freight conveyors will help provide such relief. Cars will be carried

Handling and Packaging



FRANK W. KNECHT JR.
General Manager
Brainard Steel Strapping Div.
Sharon Steel Corp.
Warren, Ohio

B. E. PHILLIPS
General Mgr., Industrial Truck Div.
Clark Equipment Co.
Battle Creek, Mich.

E. D. COOKSON
Sales Manager, Industrial Div.
Ludlow Papers Inc.
Framingham, Mass.

LESTER M. SEARS
Chairman, Towmotor Corp.
Cleveland

on belts for medium distance runs, and moving walks or belts will be used for shorter stretches.

Control systems are gaining importance in conveyor systems. Example: In a mail sorting system that's part of the current postal modernization program, the cost of controls represents about half the cost of the whole system. Features of the post office conveyors will be adapted to industrial use. Needed: Standardized, inexpensive, control subassemblies. They could be plugged together to make complete control systems.

Sharp Increases Expected In Steel Strapping Sales

Frank W. Knecht Jr.—Emphasis in 1960 will be on complete strapping systems. Improvements will be made in material handling methods; better strapping tools, most of them powered, will be developed.

The strapping industry was originally a supplier of nailing strips for crates. It has grown steadily, and today it offers tensional and heavy duty strapping and a selection of hand and power tools.

Our company has come up with significant new applications during the last few years. In one case, a team of specialists revised a large metal company's method of shipping finished products, reducing shipping costs and offering more security for materials in shipment.

In another case, strapping specialists worked with a large tire company to devise a circumferential strapping method for large off-the-road tires. It eliminated the wood blocks previously used to hold beads apart, permitted mounting of tires by one man instead of two, and made it possible to remount tires in the field. The method has been extended to all the tire company's branches and is being adopted by other tire manufacturers.

One company that produces material for electric furnace steelmaking found that bricks could be placed in a cradle and loaded into the furnace as an assembly. The method reduced material waste and made for more efficient use of labor.

Equipment Makers, Users To Emphasize Application

B. E. Phillips—Makers and users of material handling equipment will emphasize better equipment application in 1960. No major breakthroughs will occur in basic vehicle engineering.

Sign of changing philosophy: Many users are classifying their handling apparatus as production equipment. They are considering not only the relatively minor economies possible through efficient vehicle operation but also the bigger savings offered by planned, integrated handling systems.

Users will want more service from equipment manufacturers. They'll want help in such basic areas as operator training, development of maintenance controls, and establishment of equipment replacement policies.

Volatile Corrosion Stoppers Expedite Automated Packaging

E. D. Cookson—Volatile corrosion inhibitors will keep pace with every modern trend in packaging.

Introduced in 1948, the method has gained popularity with industrial and government users. Steel parts (or complete machines) wrapped in inhibitor paper, or packed in cases lined with the material, are protected from rust for extended periods. The method is suitable for all types of packaging—in-plant storage, domestic shipment, and export.

Here's how the materials will gain greater acceptance:

- Specifications will be further revised to permit the use of inhibitor papers in all branches of the government—and by industrial contractors dealing with the government.
- Successful VCI users will recommend the method to other companies. Some will require subcontractors to package with inhibitor papers.
- Chemical vapor protection will permit savings in material, processing time, and freight rates.
- The method is adaptable to automation. Inhibitor paper can be applied to paperboard and corrugated, then formed into boxes for automatic packaging of machined parts. Or it can be inserted into heat sealed pouches. Inhibitors can also be applied to heat sealable film for automatic package preparation. Future use: Package padding will be impregnated with inhibitors.

Material Handling Methods Will Be Updated in 1960

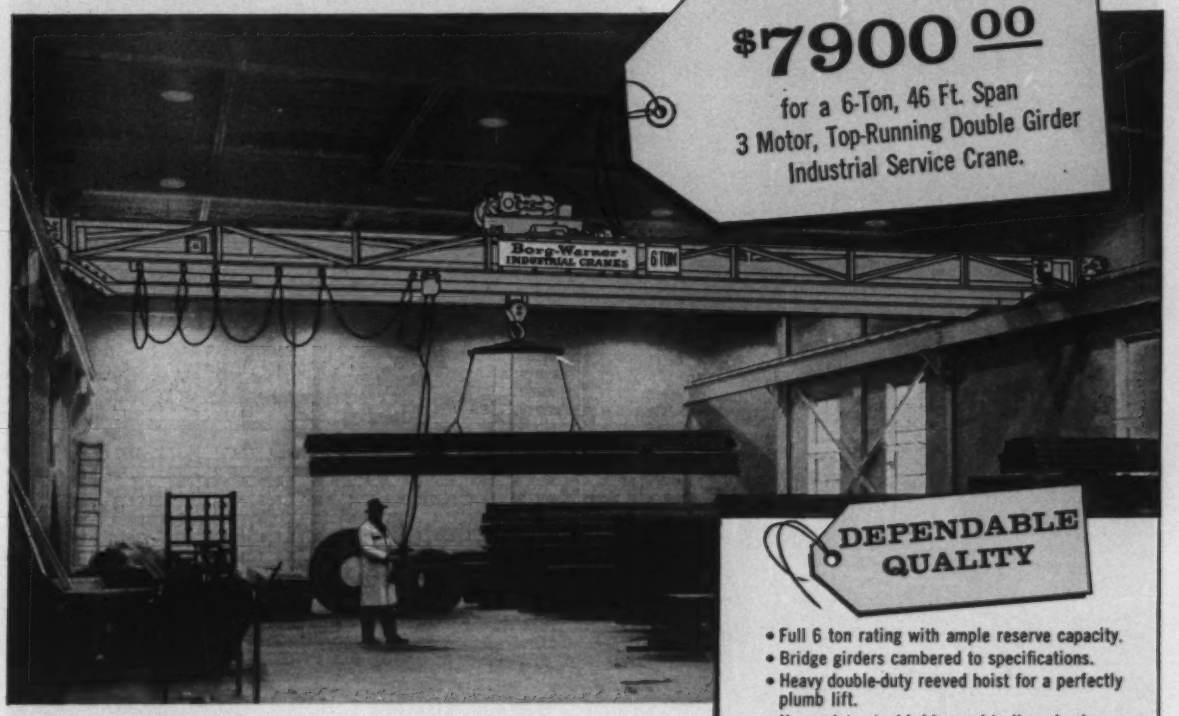
Lester M. Sears—Advances will be made in material handling methods in 1960, to meet demands of potential users. Many companies realize that a sizable slice of their manufacturing dollar is spent to move materials into, through, and out of the plant.

More than ever, management recognizes material handling as a major function in plant administration.

Spurred by the need to make every manhour and every inch of space more productive, managers will give greater attention to planned mass handling. Aim: Increased profits through reduced handling costs.

Makers of fork lift trucks and material carriers are ready to help industry develop

Now you can afford Borg-Warner Quality in your next overhead Crane...



DEPENDABLE QUALITY

- Full 6 ton rating with ample reserve capacity.
- Bridge girders cambered to specifications.
- Heavy double-duty reeved hoist for a perfectly plumb lift.
- Heavy duty steel bridge and trolley wheels.
- All welded jig bored, jig assembled end trucks.
- Long life precision ball and roller bearings throughout.
- Precision assembly of girders and end trucks with fitted bolts in reamed holes.
- Outrigger machinery girder construction.
- Magnetic bridge brake.
- Heavy duty gear reduction bridge drive.
- Fluid coupled bridge and trolley drives.
- Full magnetic push-button floor control.

ADVANCED DESIGN

The crane illustrated is a typical double girder installation. Span may be shorter or longer with greater or smaller capacity and for lighter or heavier duty, intermittent or continuous. Whatever your overhead handling requirements Borg-Warner Industrial Cranes can supply your needs with quality equipment at a price you can afford!

Advanced engineering and standardization make...

Borg-Warner Industrial Cranes

BETTER VALUES at LESS COST

Borg-Warner crane engineers and production men have taken a new look at the entire line and come up with important economies through extensive use of standardized interchangeable components. Because these savings are passed along to you, you get more crane for your money when you specify Borg-Warner Industrial!

Efficient overhead materials handling pays off. You get more overhead storage space than fork truck handling provides. You benefit from aisles and work areas uncluttered by floor-type handling equipment. You can reach all areas under the crane, the full length of the runway.

If you are planning a new factory building, an addition to present facilities or a modernization program, it will pay you to look to Borg-Warner Industrial Cranes for the best values in overhead materials handling equipment.

Industrial CRANES — INGERSOLL PRODUCTS — B-W — BORG-WARNER

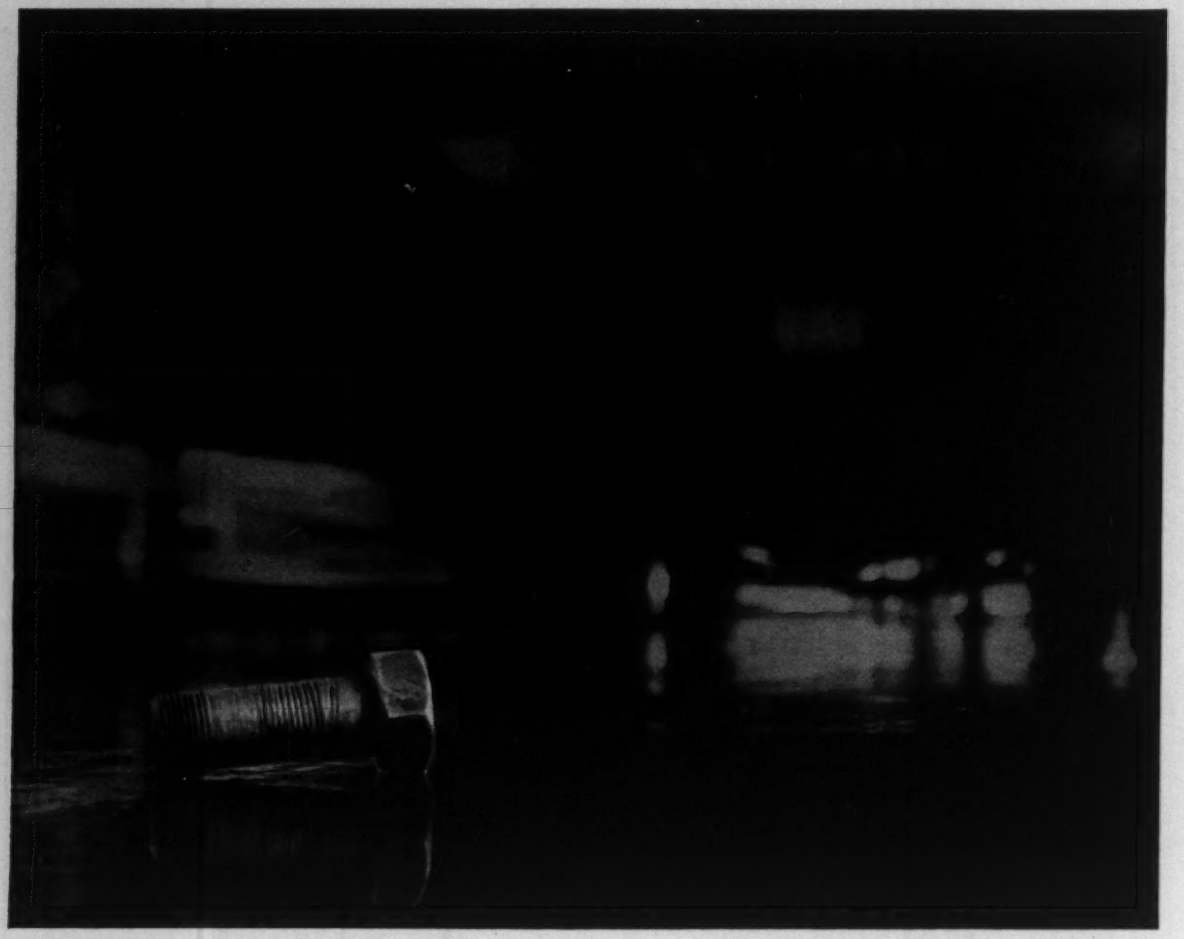
Design it better . . .
Make it better.

Find Your Nearest Distributor Under CRANES In The Yellow Pages

Distributors in all principal industrial cities.

Borg-Warner® INDUSTRIAL CRANES

1550 S. PAULINA STREET, CHICAGO 8, ILLINOIS



WHY DID THIS BOLT FALL OFF?

Where is the culprit . . . the nut whose function was to keep the bolt securely in place? Undoubtedly it fell off earlier . . . loosened by vibration . . . or unexpectedly high shock loads due, perhaps, to a careless operator. In any event, the bolt was pounded into uselessness . . . and failed. Chances are that the equipment the bolt and nut were part of is temporarily useless too.

Why then, was an inadequate fastener applied in the first place? Perhaps because "bolts and nuts" are often overlooked or specified routinely. Perhaps to save a fraction of a cent. Whatever the reason, the end result was inefficient and uneconomical. The nut failed—the fastening failed—and the product failed.

It could have been prevented. An Elastic Stop® nut would have held on. The small extra cost of the *best* self-locking nut would have solved this case . . . saved repair bills . . . downtime . . . and a manufacturer's reputation.

For detailed photos showing how some of America's foremost manufacturers of heavy equipment have insured critical bolted connections with Elastic Stop nuts on such units as rock drills, scrapers, snow plows, off-the-road trucks . . . write to ESNA. Or, for first hand proof, tell us the preferred size and we'll send you test samples. Address: Dept. S35-160, Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, New Jersey.

DOUBLE DEPENDABILITY

The dependability built into every Elastic Stop nut builds itself into the dependability of every product on which it is used.

ELASTIC STOP NUT CORPORATION OF AMERICA

Handling and Packaging

J. T. DI PIAZZA
Senior Sales Engineer
Esso Standard Oil Co.
New York

HOWARD M. PALMER
Vice President & General Sales Mgr.
Lewis-Shepard Products Inc.
Watertown, Mass.

E. W. FRANZ
Secretary
May-Fran Engineering Inc.
Cleveland

FRED L. HOOPER
Executive Vice President
Cambridge Wire Cloth Co.
Cambridge, Md.

faster, less expensive handling techniques. Compact units, almost ready for the market, combine ceiling-high stacking with the ability to drive into vans, highway trailers, and boxcars. They can carry full loads through low clearance doorways, cutting handling costs with double duty operation. Another type of lift truck will make for more efficient use of storage space. It will stack materials on both sides of narrow aisles; it will also do the work of the conventional sit-down type fork lift truck.

Demand will increase for higher capacity lift trucks and material carriers—particularly in foundries, steel mills, and metalworking plants, where unit loads may weigh up to 30 tons. Greater use of torque converter transmissions, permitting pedal-operated power application, will reduce operator fatigue in handling heavy loads.

More material handling equipment will be leased or rented this year by smaller firms that have periodic need for it. But an industry survey indicates that more capital will be allocated for the purchase of new equipment.

Emulsifiable Rust Stoppers To Get Wide Use in Sixties

J. T. Di Piazza—Emulsifiable rust preventives will become more popular in the sixties. They are inexpensive, nonflammable and have established their reliability in several applications. Present products will be improved; other types will be developed for new applications.

Emulsifiable rust preventives are suitable for protection of parts in process and for those stored indoors. They can be applied by spraying, dipping, or brushing, but dipping is preferred because it leaves a more uniform film.

Two general types are available. One leaves an oily protective film on the part to be protected; the other leaves a semisolid film. The semisolid film usually gives greater protection; when parts are wrapped, the film doesn't wick off.

One problem: The emulsion separates under adverse conditions. The semisolid film material is more likely to separate because it's more difficult to emulsify. Better preventives under development will be better able to resist the contamination and adverse handling encountered in industry.

Choice of Handling Equipment May Decide Production Costs

Howard M. Palmer—Many handling problems will be solved by improving standard equipment and utilizing attachments. But the user must realize the importance of material handling in his corporate growth. He must let the material handling equipment manufacturer provide more and better handling equipment.

The technology of the material handling manufacturer must improve to keep pace with the demands of industry. Research and development programs employing specialists in hydraulic, electrical power, and equipment design will be needed to develop more efficient equipment for more complex, higher volume operations.

The material handling engineer must be recognized as a full fledged member of the production team. He should be responsible for the selection, installation, and evaluation of handling equipment.

Material Handling Equipment To Join in Building Boom

E. W. Franz—Makers of material handling equipment will get a shot in the arm from the metalworking industry in 1960. Statistical information indicates an upswing in industrial building, and capital expenditures for plant expansion will hit another high.

The metalworking industry is quick to recognize and use every available material handling advancement, especially in new facilities. Increased use of mechanized handling equipment in new plants will help industry hold production costs in line, in spite of pressure from labor for higher wages.

Our organization is preparing for increased product demand. A standardization program will help stabilize prices. Such a program will also help us provide better delivery and service to our customers.

Protective Coating Materials Widen Wire Cloth Application

Fred L. Hooper—The application of woven wire conveyor belts and slings will broaden considerably in the early sixties because of special coating materials that have been developed for metal bases. Metal cores will offer strength, and coating will permit belts and slings to be used on jobs previously impossible.

The materials, and others in the development stage, will provide products with all the advantages of the coatings and the strength of steel:

- Graphite coatings. They're vital in the development of self-lubricating wire conveyor belts.
- Tetrafluoroethylene resin (Teflon). Antisticking properties, low coefficient of friction, resistance to many chemicals, and abrasion resistance will permit application of metal mesh belts in temperatures of −100 to 480° F, in chemical, rubber, food, and munition plants.
- Elastomer chemical (Neoprene). The material is tough, resilient, oil and grease resistant. It's also resistant to sunlight, moisture, and flames. And it doesn't deteriorate rapidly with age. It can be used

(*Please turn to Page* 314)

this 140-TON horizontal milling machine

There's never been one like it before!

Just a press of a button puts this mighty Schiess into action. A 25-ft. high column moves smoothly along 45-ft. long bedways. Never a vibration—no chatter—even at maximum transversal loads! The new Schiess design of the spindle heads has eliminated this!

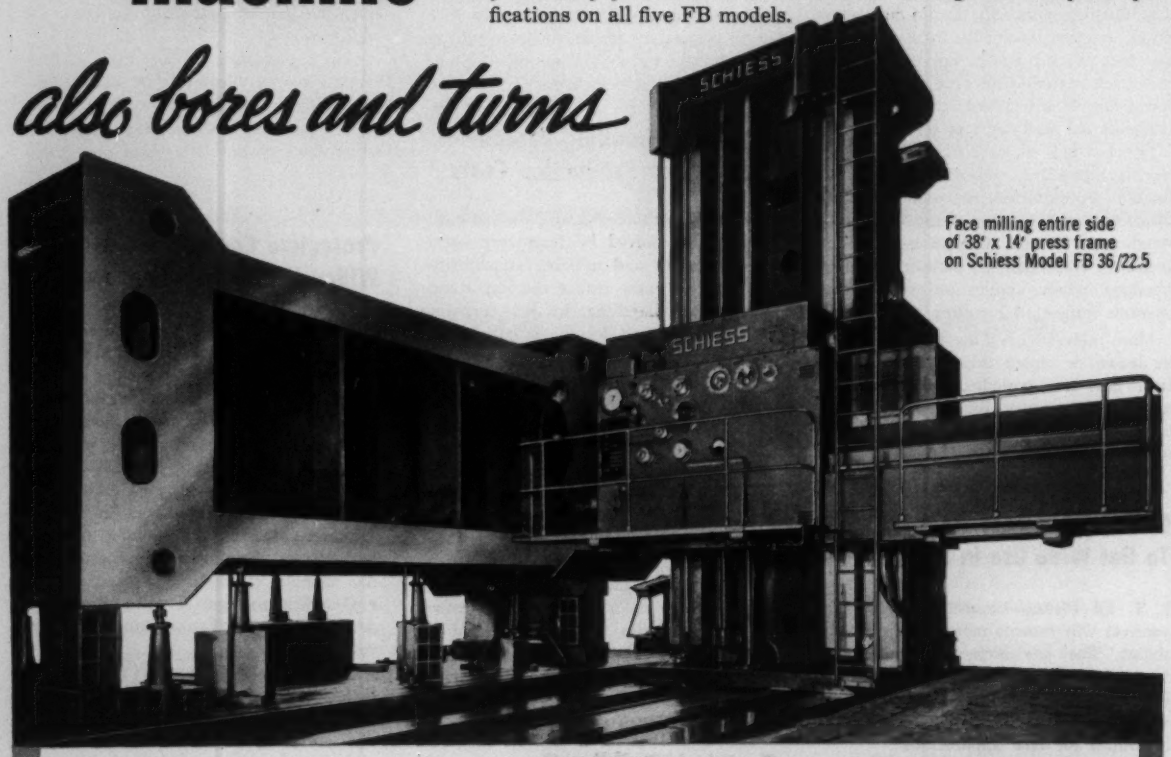
THE MILLING OPERATION. A huge tungsten-carbide cutter in a 14¼" spindle goes to work on the stock. And performs its operation with a consistent accuracy—a surface-finish count—never before obtainable on such a big fellow.

THE BORING OPERATION. Another press of a button! Another spindle goes to work—bores a 79" depth in one cut—or a total depth of 118". Boring and milling spindles are provided with 36 speeds of which the top 12 are V-belt transmitted. Rapid traverse, feeds and manual controls of the two spindles are completely independent.

That this mighty machine has tremendous productive capacity is self-evident. And its productivity goes far beyond conventional milling and boring. Schiess attachments increase its scope to taper-milling, thread-cutting, copying and, in certain instances, copying in 3 dimensions. It's a time saver, too. Can go from feed to rapid traverse immediately, without complicated adjustments.

The Schiess Model FB 36/22.5 Horizontal Milling and Boring Machine is a product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess Engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all five FB models.

also bores and turns



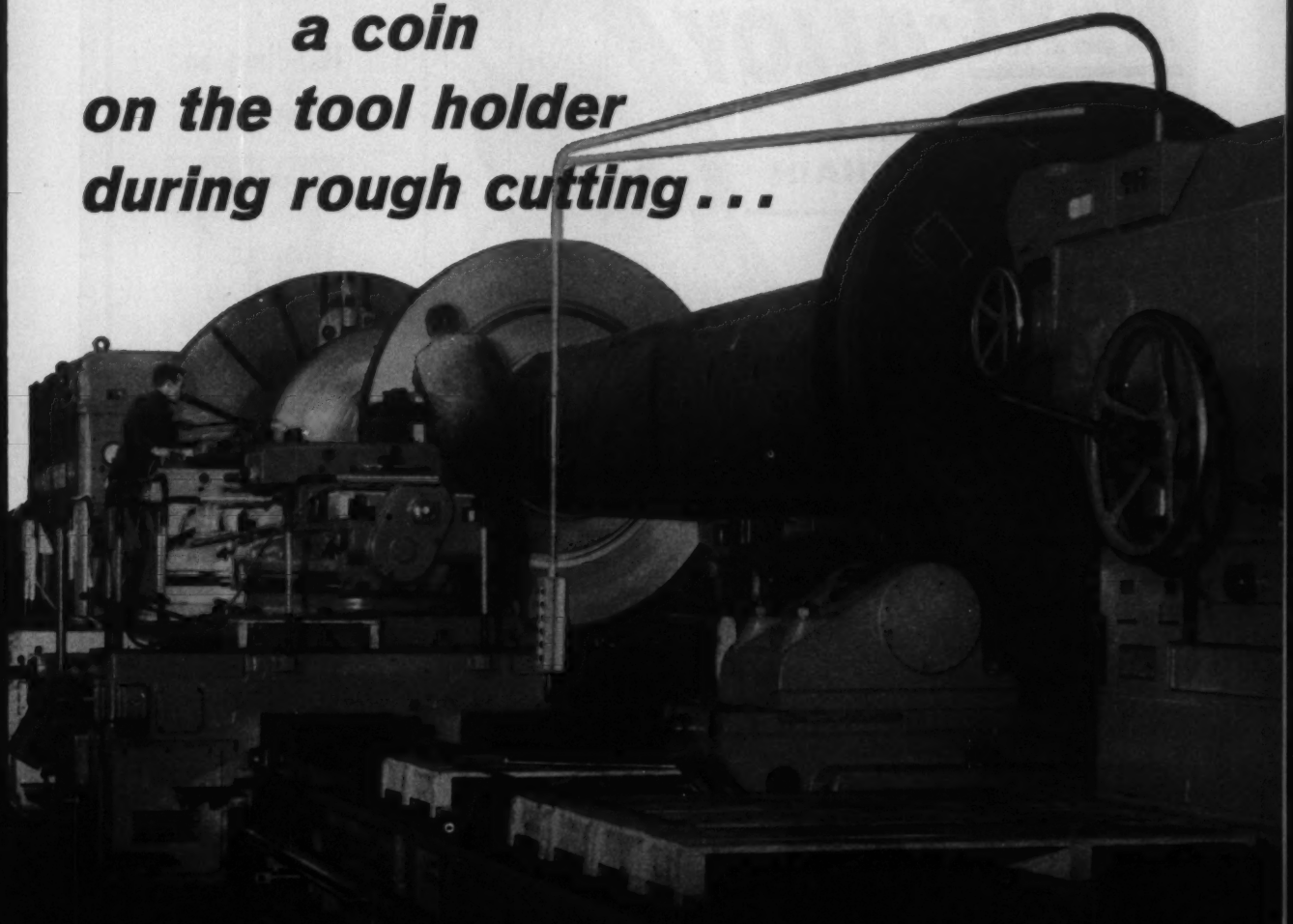
Face milling entire side of 38' x 14' press frame on Schiess Model FB 36/22.5

SCHIESS

AMERICAN SCHIESS CORPORATION

1232 Penn Avenue, Pittsburgh 22, Pa.

you can balance a coin on the tool holder during rough cutting...



on this

waldrich high speed lathe

Series WSD

- Rigid construction insures vibration-free operation with carbide tools.
- Maximum utilization of horsepower in main drive
- Rugged headstock
- Heavy duty tail stock
- 3-way and 4-way bed design
- Fast, efficient chip collecting

Write for details today.

WALDRICH SIEGEN

american waldrich mfg. corp.

1232 PENN AVENUE, PITTSBURGH 22, PENNSYLVANIA

HERC-ALLOY

THE ORIGINAL ALLOY STEEL CHAIN

Herc-Alloy has many superior features ...has high tensile strength...is lighter, therefore easier to handle... is long wearing...offers high resistance to impact loading...is INSWELL welded.

Herc-Alloy is sold in running lengths and in all types and sizes of sling chains assembled to customers' specifications. CM also produces a complete line of chain attachments and welded chain of all types including stainless steel.

● Write for Data Book covering Herc-Alloy Sling Chains, including helpful information on their assembly, care, use and inspection.

Hammerlok®
COUPLING LINKS

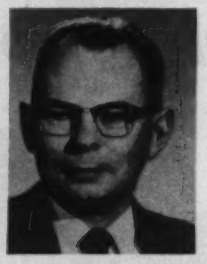
● Assemble or rebuild your own Herc-Alloy sling chains with all components furnished by your local distributor. Hammerlok is simple, safe, reusable. New Herc-Alloy assemblies can now be ordered with welded or Hammerlok Coupling Links as desired.

CM CHAIN

CALL YOUR CM CHAIN DISTRIBUTOR

COLUMBUS McKINNON
CHAIN CORPORATION
Tonawanda, New York
NEW YORK • CHICAGO • CLEVELAND
LOS ANGELES • SAN FRANCISCO
In Canada: McKINNON COLUMBUS CHAIN LTD.
Herc-Alloy® ST. CATHARINES, ONT.

Handling and Packaging



R. F. RICE
Manager, Crane Dept., Whiting Corp.
Harvey, Ill.

(*Concluded from Page* 311)

in temperatures from 180 to 250°F for blast machine doors and sling coverings.

• Silicones (silicone heat resistant rubber). The material looks and feels like organic rubber, but it can take longer exposure to moisture, sunlight, and corrosive atmospheres. Recommended temperature range: −130 to 500° F. Combined with a metal mesh belt, it is suitable for handling hot clay, hot lightweight aggregate, hot sinter, or hot limestone.

• Polyvinyl chloride (Plastisol). Reliable plastic won't harden, crack, or check with age in temperatures from −75 to 185° F. Available for clear or opaque coatings, it offers a resilient surface for woven wire slings, to protect missile bodies, rocket bodies, polished shafting, and other easily damaged parts.

Rectifiers, Hydraulic Drive Will Update Overhead Cranes

R. F. Rice—Makers of overhead, traveling cranes will continue to update their products in the sixties. Recent development: Some cranes depend on hydraulic drives instead of electric motors for hoist and travel motions. Electric motors (one for the bridge and one for the trolley) drive hydraulic pumps in one direction, at constant speed. Such electrical equipment isn't expensive, and it's easy to maintain.

Crane motion is controlled by valves that regulate the flow of oil to low inertia hydraulic motors. The control is stepless and infinitely variable from zero to full speed. And the hoist raises or lowers its load at constant speed for a particular control handle setting.

Hydraulic drives make possible more effective safety devices than those ordinarily used in cranes. Lifting capacity can

Photo courtesy of Jones & Laughlin Steel Corporation

BAKER'S MAGDOLITE AND JEBCOLITE
are always 5 ways better

Continued research and development throughout the years, plus The J. E. Baker Company's precisely controlled manufacturing methods, have resulted in the superior, properly burned, grain-sized Magdolite and Jebcolite particles which help provide:

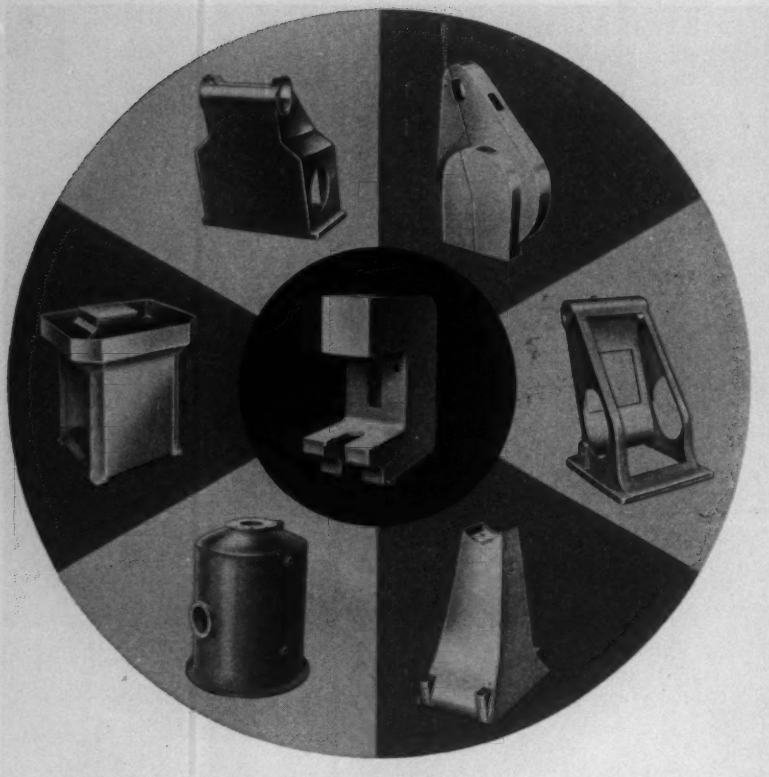
More uniform ingots—increased ingot production—increased furnace efficiency—lower refractory costs—less defective production material.

Magdolite and Jebcolite* are the *original* dead-burned dolomites that offer better composition, preparation, strength, economy and quality. Don't say "dolomite." Save dollars. Specify Baker's Magdolite for open hearth and Jebcolite for electric furnace use.

** Jebcolite has the same superior chemical, physical and mineralogical characteristics as Magdolite and differs only in grain size which is designed specifically for electric furnace application.*

JEBCO
PRODUCTS
SINCE 1889

THE J. E. BAKER COMPANY
YORK, PENNSYLVANIA
PLANTS: BILLMEYER, YORK, PENNSYLVANIA — MILLERSVILLE, OHIO



WELDMENTS

by KIRK & BLUM

There is good reason for K&B's ability to fabricate your weldments with substantial savings in time and cost. The extensive facilities and equipment of a 170,000 sq. ft. plant enables the experienced K&B craftsman to utilize his production ingenuity to the fullest. Unique methods and tooling are repeatedly developed and utilized efficiently.

Kirk & Blum's capacity for steel and alloy fabrications to ½" thickness and up to 25 tons is vividly shown in a new 40-page Sheet and Fabrication Catalog. Request your copy or, even better, send your prints for a K&B proposal.

THE KIRK & BLUM MFG. CO.
3226 Forrer Street Cincinnati 9, Ohio

KIRK & BLUM

Handling and Packaging

JOHN A. BALDINGER
Vice President, Materials Handling Operations, Yale & Towne Mfg. Co. New York

be limited to the approved maximum by setting a relief valve. That makes for safer material handling, preventing crane overloads. The hydraulic circuit blocks the output of the hydraulic motor as the crane hook is lowered in case of pressure loss in the circuit, or a pump motor power failure. The conventional, electrically released shoe brake is replaced by a brake that is released hydraulically. Either the blocked hydraulic circuit or the shoe brake will stop and hold the load.

Look for Big Developments In Material Handling Units

John A. Baldinger—Material handling equipment will play a decisive role in the coming era of industrial expansion. Developments will be rapid and bold.

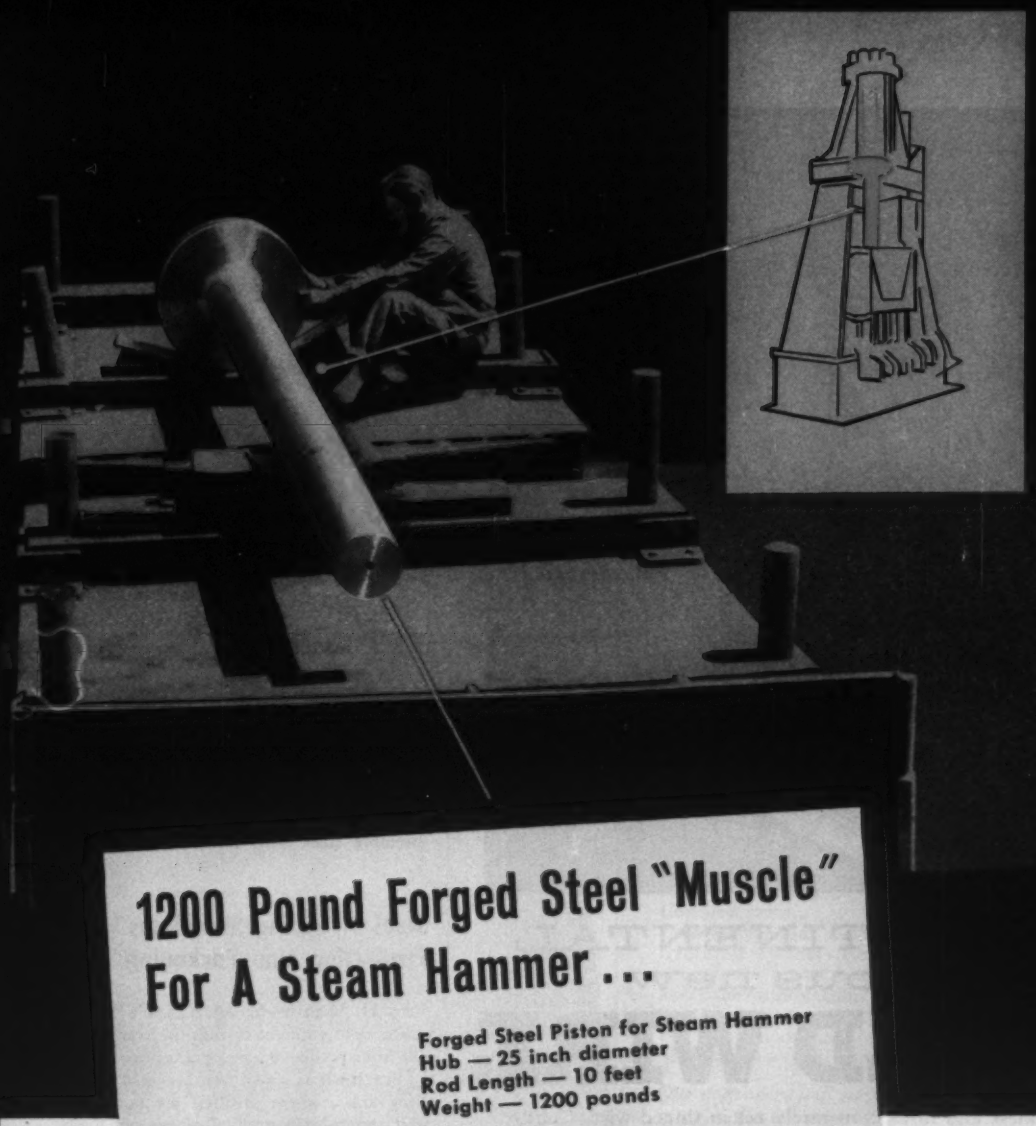
In the next few years, fork and industrial lift trucks will hoist loads higher and faster. They will also have greater stability. Lower profile vehicles will permit more efficient use of equipment in trailers and boxcars.

In the next two or three years, the average fork lift truck will handle 6000 lb per load vs. about 4000 lb today.

New type transmissions will gain universal use in gasoline powered trucks. Torque converters, hydrostatic, and gas-electric elements will reduce operator fatigue, speed vehicle operations, and cut maintenance costs. Gas turbines are being considered for use in larger capacity industrial lift trucks.

Current interest is in the chemical reaction cell, which generates electric current from gaseous matter. Engineers continue to study solar energy and radioactive isotopes as future sources of vehicle power.

To accelerate material movement and to decrease handling costs, the "systems"



1200 Pound Forged Steel "Muscle" For A Steam Hammer...

Forged Steel Piston for Steam Hammer
Hub — 25 inch diameter
Rod Length — 10 feet
Weight — 1200 pounds

Delivering the rated blow to steam hammer sow block and dies, this 1200 pound forged steel piston rod can "dish it out . . . and take it too" A mighty midget muscle controlling a big steel fist that hammers out drop forgings.

Relatively, this is a small but very tough forged component, compared to a 50 ton forged steel bending roll, or a 40 ton rotor for a power turbine.

The point is, however, that this 1200 pound forging is made with the same engineering and metallurgical supervision, the same experienced craftsmanship as the biggest, most critical forging produced in our shops. Quality control from raw material selection to finish machined component is standard operating procedure in our forge shops and foundries.

Let us consult with you before you select your source for steel forgings and castings.

ERIE FORGE & STEEL CORPORATION

ERIE, PENNSYLVANIA

from CONTINENTAL
a lustrous new
TINNED WIRE

Here's smoothness and luster you rarely get in tinned wire. Continental's technical skill makes possible an enduring, uniformly bright finish . . . a wire so bright that it can replace plated wire on many products. It retains its brightness for long periods of time in normal use. Continental tinned wire meets your needs for quality and workability and is available in almost any temper and analysis in medium low carbon and low carbon steels.

FINE—16 gauge through 30 gauge, in 8" diameter coils
COARSE—20 gauge through 5/16", in 16" and 22" diameter coils.

For smooth beauty and high degree of perfection in wire, you will want to investigate Continental Tinned Wire. Write or Telephone—today; or return coupon below.

FILL OUT AND RETURN COUPON TODAY

NAME_____ TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____
☐ Send Complete Details ☐ Have Salesman Call

CONTINENTAL STEEL
CORPORATION • KOKOMO, INDIANA

PRODUCERS OF: Manufacturer's Wire in many sizes, tempers, and finishes, including Galvanized, KOKOTE, Flame Sealed, Coppered, Tinned, Annealed, Liquor-Finished, Bright and special shaped wire. Also Welded Wire Reinforcing and Galvanized Fabric, Nails, Continental Chain Link Fence, and other products

Handling and Packaging

JOHN H. MORAVA
President
United States Steel Supply Div.
U. S. Steel Corp.
Chicago

approach will be followed; handling steps will be eliminated wherever possible. Production facilities without stockrooms will be common; materials will be brought to the plant in boxcars or trailers and moved directly from shipping units to assembly lines with fork trucks.

Steel Strapping Stimulates Production Line Packaging

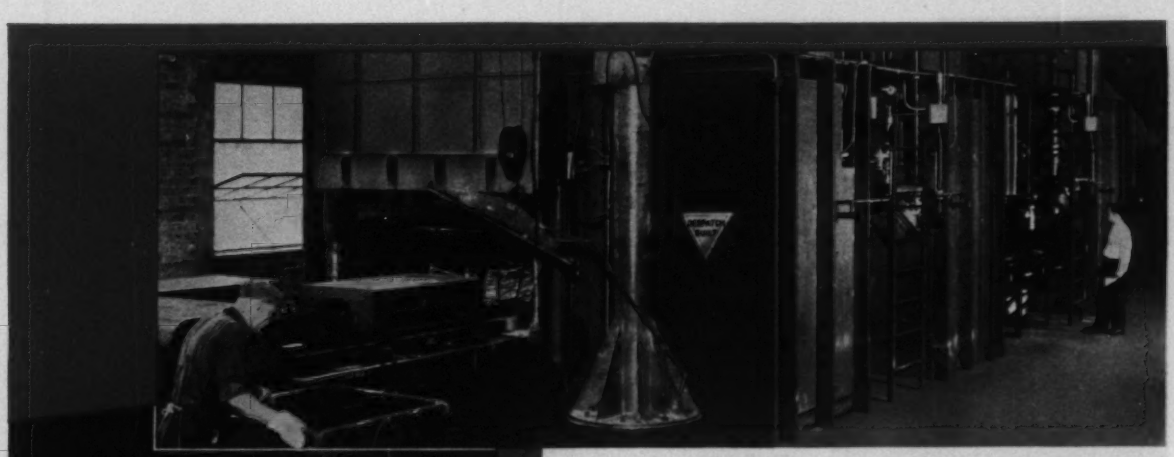
John H. Morava—Manufacturers will become more aware of savings they can realize from production line packaging.

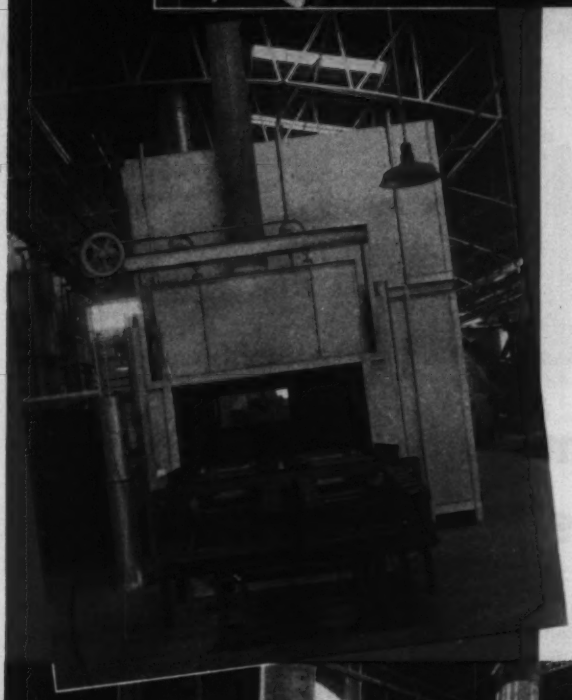
The trend is away from isolated shipping areas, where products are packaged and shipped piecemeal. Gaining popularity: Fully automated operations, with strapping machinery tied into the assembly line. The development of strapping machines to handle a wide variety of sizes and shapes has popularized the production line approach to packaging.

Big technological hurdle faced by the industry: Development of automatic strapping machines to handle intermixed packages in several sizes. Some progress has already been made. Automated round strapping machines are used in nail packaging and in newspaper circulation departments. Items move from the production line to the loading dock without interruption. Machines under test will offer the same advantages in other applications.

In the works: Strapping machines that can be adapted to any line. In some applications, stationary units may be effective; in others, powered portable equipment may be more suitable.

To reduce losses caused by human error or mechanical breakdown, strapping material is constantly being improved. Researchers have developed a method of abrasive blasting to remove oxides from the strap and condition the edge.





Heat treatment of metals can fit modern production methods

Metal products manufacturers needs for modern material handling to cut production costs and to improve control over heating and cooling cycles in metal heat treatment are being met by Despatch engineers. Illustrated here are several furnace designs that mechanize loading and unloading. Modern instrumentation provides automatic cycling, even for complex program controls.

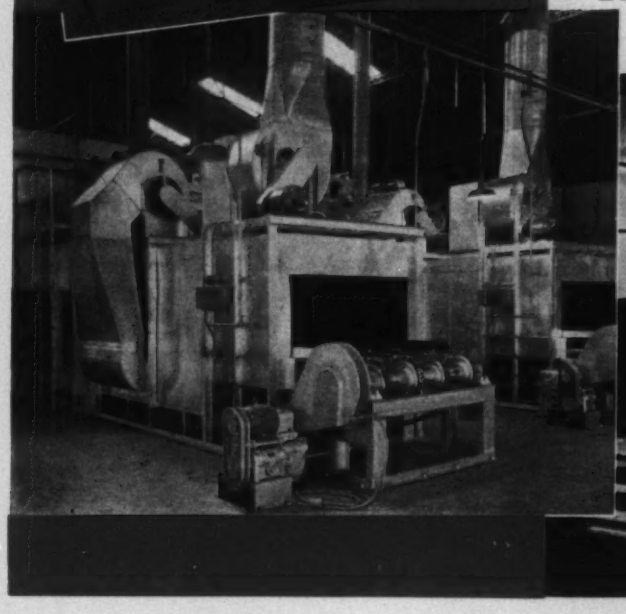
Small quantity production and quick change-over has been considered in developing some furnace systems. These have proved popular in certain production programs.

Despatch has developed both mechanical and hydraulic systems for various furnace functions to achieve the lowest cost with maximum efficiency . . . also other innovations to improve heat treating production up to maximum temperatures of 1350° F. For your modernization program in heat treatment of metals—write Despatch.

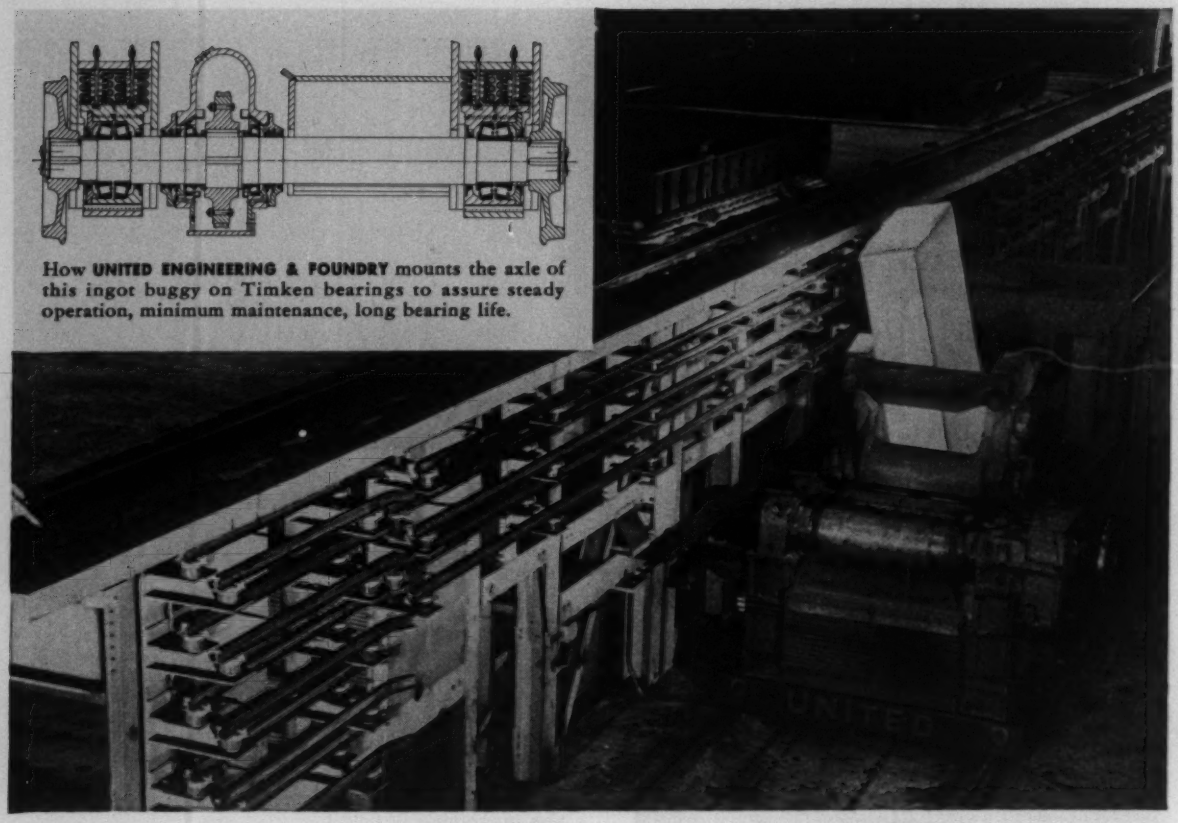
Our engineers will provide many valuable suggestions.

DESPATCH

DESPATCH OVEN COMPANY
611-8th Street S.E.
Minneapolis, Minnesota



How **UNITED ENGINEERING & FOUNDRY** mounts the axle of this ingot buggy on Timken bearings to assure steady operation, minimum maintenance, long bearing life.

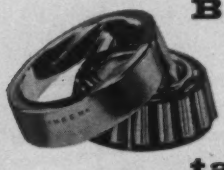


Keeps hot slabs moving fast with 27 Timken® bearings to keep it rolling

THIS United ingot buggy moves hot slabs and keeps 'em moving fast from a major steel producer's slab mill. To make sure the buggy moves the heavy loads steadily, with minimum maintenance, its builders, United Engineering & Foundry, equipped it with 27 Timken® *tapered* roller bearings. They're used on the axle drive worm shaft, axle journals, worm gear tilting drive worm shaft and tilting drive pinion shaft.

Timken bearings keep shafts aligned, gears meshing accurately. The tapered design of Timken bearings enables them to take any combination of radial and thrust loads. And full-line contact between rollers and races provides maximum stability. Cost-saving results are: shafts are held rigid; gears mesh smoothly and accurately; shaft wear is eliminated; gear wear reduced.

Any machine with Timken bearings gives you *extra* benefits—the benefits of Timken Company leadership in tapered roller bearing design and in engineering service. It's leadership backed by the most modern research and development facilities in the bearing industry. To get the most out of the machines you build or buy, specify Timken bearings. ***When you buy Timken bearings you get . . .*** *1) Quality you can take for granted. 2) Service you can't get anywhere else. 3) The best-known name in bearings. 4) The pace setter in lower bearing costs.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*



BETTER-NESS rolls on

TIMKEN®

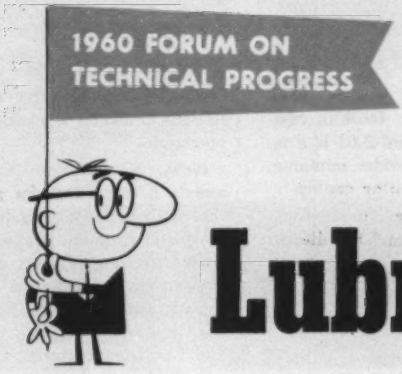
tapered roller bearings

ALAN B. MYLER
Chief Engineer, Metalworking Oil Dept.
Sun Oil Co., Philadelphia

W. J. BROWN
Staff Production Application Engineer
Marketing Technical Sect., Gulf
Research & Development Co., Pittsburgh

W. G. PULLIAM
Vice President, Cities Service
Research & Development Co. Inc.
New York

M. F. TROUTMAN
Sales Engineering, Esso Standard
Oil Co., New York



Lubrication

More Additives Being Used In Cutting, Grinding Oils

Alan B. Myler—Chemical additives containing new forms of sulfur, chlorine, and phosphorus are being used extensively in metal cutting and grinding oils to meet the demand for improved finishes.

An increasing amount of hot oil quenching is being employed in heat treating. Reason: To minimize distortion. To be successful, it is generally necessary to use a fast quenching oil which will develop a satisfactory hardness in steels quenched at 250 to 300° F.

Cleaner Steel Strip Produced With New Soluble Oils

W. J. Brown—Improved soluble oils for cold rolling carbon steels will be capable of producing mill clean strip. Special emphasis will be given to application and filtration to insure proper cooling with clean emulsions.

The oils clean better, offer excellent burn-off during the anneal process, permit higher mill speeds with lower rolling temperatures, and provide good rust protection when applied as a solution or a concentrate.

During the past year one of the oils proved satisfactory in tests abroad. Operations on both tandem and reversing mills indicated that the material provided proper lubrication and cooling and maintained close tolerances at higher speeds and lower mill loads. Inspection of the annealed strip at the skin pass showed the steel to be clean, free from carbon or stain.

Soluble roll oils will continue to play a large role in the steel industry's efforts to produce high quality strip steel at lower operating costs. The demand for higher mill speeds and longer roll life will further encourage the development and use of soluble roll oils for cold rolling strip steel.

Cites Improvements in Handling Multipurpose Lubricants

W. G. Pulliam—High quality multipurpose lubricants have lowered lubrication costs, cut inventories, improved housekeeping, and reduced application errors.

More attention is being given to improved methods for handling large amounts of the materials. Bulk delivery, storage, and handling of steel mill greases are under co-operative study by greasemakers and steel mill customers. Superior pumpability and stability of the newer steel mill greases make bulk movement directly from grease kettle to bearing possible. The system virtually eliminates drum storage, handling, and residual waste in empty drums.

New Law Involves Lubricants On Food Grade Foils

M. F. Troutman—Aluminum producers must look at rolling lubricant residues on their food grade products, asking: What is the extent of residues present? Do they migrate? To what extent?

Reason: The Food Additives Amendment of 1958 may require package suppliers to petition the secretary of health, education, and welfare for a tolerance on roll oils.

Both the Foils Division of the Aluminum Association and the American Petroleum Institute have been busy with problems that the new law may impose. One result has been a program on the

Lubrication

JEROME T. COE
General Manager, Silicone Products Dept., Chemical & Metallurgical Div. General Electric Co., Waterford, N. Y.

C. T. LEWIS
Chief Lubrication Engineer
Republic Steel Corp., Cleveland

JOHN A. BOYD
Vice President
Van Straaten Chemical Co.
Chicago

K. L. BERKEY
Senior Project Engineer
Wright Air Development Center
Wright-Patterson Air Force Base, Ohio

part of the petroleum supplier to furnish information on the chemical composition of products used in rolling foil.

Petroleum suppliers, aware of the implications of the law, are active in research on superior roll oils. The work is directed toward controlling chemical compositions while providing performance characteristics that will not affect present rolling or annealing practices. Most of the work centers on low viscosity oils (30 to 40 Saybolt Seconds Universal at 100° F) that are commonly used in foil production.

Silicone Lubricants Withstand Wide Range of Temperatures

Jerome T. Coe—Usage of silicone lubricants will continue to increase: One reason: Versilube silicone fluids, for example, lubricate over a wide temperature range (−100 to 500° F) and can be used in a variety of rolling friction or sliding friction applications.

The fluids have good storage stability and are nonreactive with water. The lubricant pours below −100° F and is pumpable below −65° F and at 500° F. It can also be formulated into greases. One grease (G-300) resists oxidation and mechanical breakdown under temperature extremes. Typical use: Class H motors in high temperature operation.

Another grease (SS 4007) is designed as a rust inhibitor for mated, threaded, and nonthreaded ferrous components. It maintains its consistency from −75° to 400° F and is serviceable where other materials would solidify, oxidize, evaporate, or bleed excessively. It also has good storage stability and is easy to apply—it can be brushed, wiped, or sprayed on.

Two silicone products have been introduced in the shell casting field. XS 4010 is a heavy duty break-in compound for patterns, and SM-2003 is a release emulsion which provides minimum buildup on the pattern during casting.

Look for increased usage in ore flotation, steel ingot casting, and the diecasting of nonferrous metals.

Automatic Lubrication Ups Production Time

C. T. Lewis—The continuing expansion of automatic lubricant application is increasing available machine hours and cutting repair and maintenance costs. Savings are also obtained from eliminating the manhours formerly used on hand lubrication.

Experience shows that filtration and purification of in-use lubricating and hydraulic materials can be improved. In addition, the choice of the lubricant and hydraulic media can also affect net benefits.

The design of straining, filtering, and other purification equipment is being improved, and methods of application are being reviewed for best results.

Reports Revived Interest In Special Lubricants

John A. Boyd—Special tool lubricants with new chemical additives mark a countertrend to the search for a universal cutting and grinding fluid.

The special lubricants are needed to meet increasingly rigid performance demands. For instance, at one time a plant would look for a water soluble tool lubricant that would give satisfactory tool life and finish on a number of machining operations.

Now, in addition to normal demands, it might look for a tool lubricant that will meet these conditions. 1. Work in special filtration equipment—give controlled foaming or meet other needs. 2. Prevent the formation of deposits on automatic gaging equipment that's tied into the production line. 3. Remain stable and free from bacterial attack for periods of six months to a year. 4. Handle contamination from hydraulic or lubricating oil without losing any performance value.

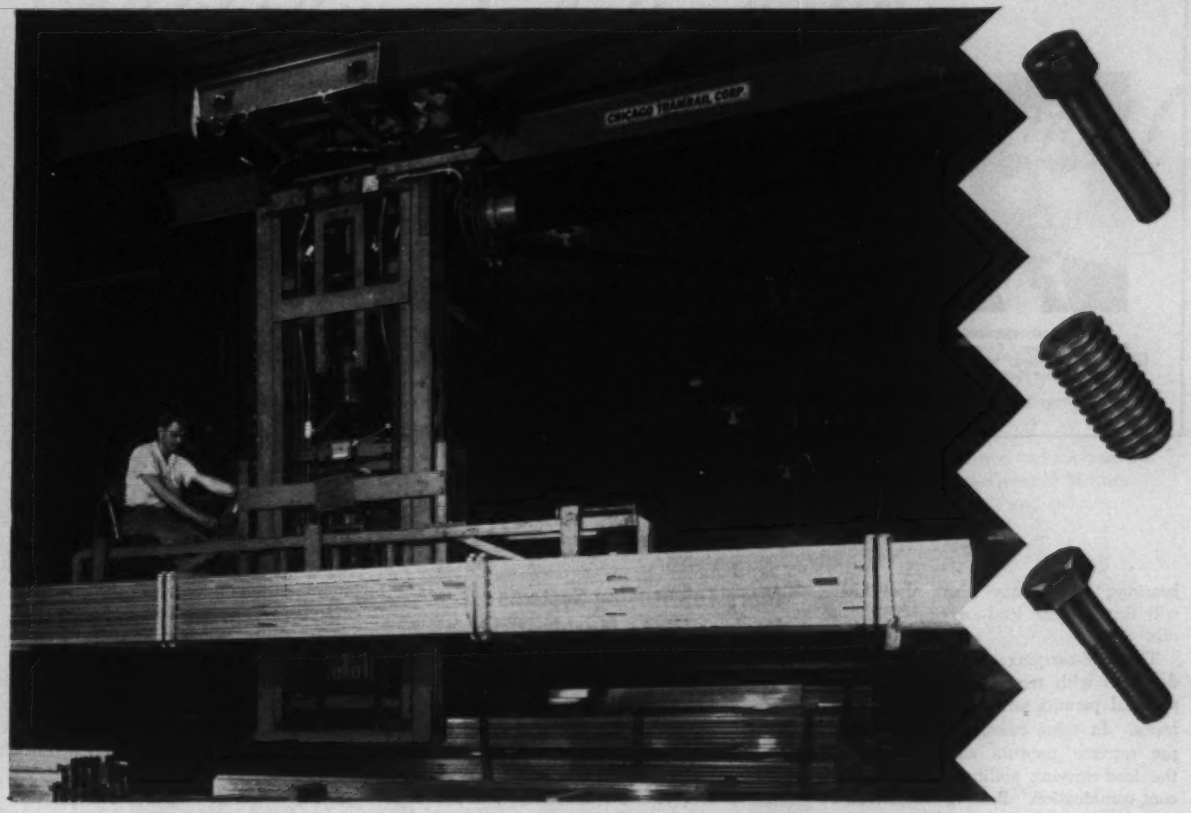
The increase in the number of different metals or alloys that are handled adds to the difficulty of getting economical performance from one universal lubricant. Changes in alloys or metals change tool lubricant requirements and make it more economical to meet the changes with a special tool lubricant.

Space Age Oil Dumped After Passing Through Engine Once

K. L. Berkey—Each new series of aircraft engines calls for higher temperature lubricants.

As horsepower increases, heat rejection rates to the oil go up. Due to the high flight speeds (which result in extreme ram air temperatures), air as a heat sink is lost. Fuel is used as the oil coolant. However, the bulk fuel temperature is also rising because of aerodynamic heating, which limits permissable heat rejection to the fuel. The only solution is to permit oil operating temperatures to increase. Engine component operating temperatures will increase. New high temperature steels will help in gears,

IT PAYS TO STANDARDIZE ON STANSCREW



17 different Stanscrew fasteners used in Chicago Tramrail's Trak-Rak

"In constructing our complete line of cranes we make no compromise with the most rigid requirements of safety," says S. W. Fountain, Vice-President, Chicago Tramrail Corporation. "Therefore, reliability is our principle reason for standardizing on quality components such as Stanscrew fasteners."

"But Stanscrew gives us more than fast service and reliable products. Their broad line of over 5,000 fasteners offers a wide selection . . . and their fastener specialists and engineers are always ready to assist our design department in determining the strongest, safest, most economical fastener for every application. For example, in our Trak-Rak stacking crane above, 17 different Stanscrew fasteners are used . . . each selected after careful study for the precise job it has to fill."

Like Chicago Tramrail, many other industrial leaders have learned it pays to capitalize on Stanscrew's backlog of over 80 years of fastener experience. To use this accumulated knowledge in solving your particular fastener problem, just call your Stanscrew distributor. He will quickly arrange for a visit from your Stanscrew fastener specialist.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

Lubrication

WILLIAM G. JENNINGS
Project Engineer, Centralized Lubrication Systems, Alemite Div. Stewart-Warner Corp., Chicago

RALPH E. CRUMP
Chief Engineer, Electrofilm Inc. North Hollywood, Calif.

H. A. HARTUNG
Supervising Engineer, Research & Development Dept., Atlantic Refining Co. Philadelphia

R. Q. SHARPE
Manager, Industrial Technical Div. Products Dept., Socony Mobil Oil Co. Inc., New York

bearings, and pumps where the change will double gear load-carrying ability of oils.

The load-carrying ability of a material decreases with temperature rise. A new material permits satisfactory load-carrying levels. In some cases, it is necessary to use extreme pressure additives to raise the load-carrying ability of a gear-lubricant combination. Bearing fatigue can be a problem when temperatures increase. At higher temperatures, oil viscosity decreases and proportionately reduces bearing fatigue life.

Due to the extreme temperatures in the new engines, pumps will be all steel. No major problems are anticipated with pumps except for a possible wear problem in hydraulic units. Material combinations will need to be carefully selected to minimize sliding friction wear.

With increasing flight speeds and shorter flight durations, systems other than the normal oil circulation system may become feasible. An example is the one-pass or throwaway system where the oil goes through the engine once, then is dumped overboard.

Turbopump and gearbox lubricants in missiles and space vehicles encounter high speeds, high gear loads, along with lightweight design. Due to short operating times, the problems are not insurmountable. Experience indicates volatility and foaming will be bothersome. Fluorocompounds and liquid propellents are under investigation.

Requirements for secondary power system lubrication include: Closed cycle systems using liquid elements (such as potassium, rubidium, mercury, and sulfur) as lubricants, and the use of gas lubricated bearings up to 1800° F. Bearing materials are one limitation on gas bearings.

More Lubricating Systems Designed into Machines

William G. Jennings—The trend toward pre-engineering lubricating systems is bound to develop rapidly. Designers and manufacturers of industrial machinery and equipment realize that the method or system of supplying the lubricant significantly affects capital and operating costs.

In lubrication pre-engineering, the machine designer incorporates a lubricating system into the basic machine design, rather than providing it as optional equipment.

The trend toward more automatic system operation will increase. Feedback controls (where the machine regulates its own lubricant supply) will become more common. More sophisticated, automatic control of the lubricating system will permit equipment to operate better.

Solid Lubricants Work In High Vacuum Systems

Ralph E. Crump—High vacuum systems present lubricating problems never experienced in conventional atmospheres. In the extremely low pressure atmospheres, ordinary oils and greases sublime quickly. Metal-to-metal contact can be prevented only through the use of a lubricant that is independent of partial pressure.

A search revealed a few materials. Among them were solid lubricants such as molybdenum disulfide. It relies partially on absorbed sulfur for its lubricity and has shown its ability to function in a vacuum. Only inorganic binder (such as the promising lead containing glass-ceramics) can be used. Reason: All other binders sublime in this application.

Solid film lubricants with increased corrosion resistance over precious films are being made with new materials. Advantages: 1. The elimination (in some cases) of electroplating under the lubricant (where it was used to prevent corrosion). 2. Increased life of marginal electroplating in severe applications.

Better Lubricants, Fluids Will Reduce Maintenance

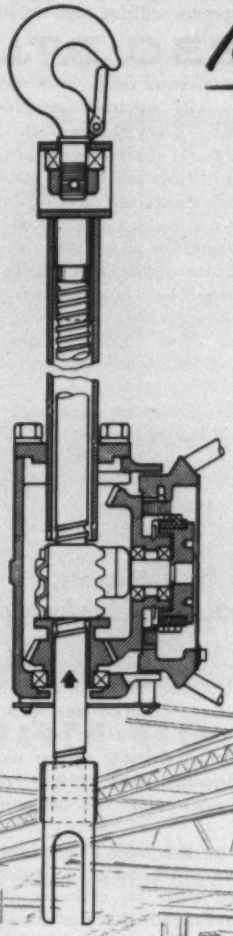
H. A. Hartung—Better industrial equipment and lubricants are being developed. Industry is becoming aware of the economies of machines kept operating with low maintenance by quality lubricants.

We expect three developments to be emphasized: 1. Fire resistant hydraulic fluids will be tried in a variety of industrial applications. The safety features of these products and the low cost and excellent lubricating ability of water-in-oil emulsions are promising. 2. More long life, ball bearing greases will be used. 3. The use of multipurpose greases is expected to expand. These greases provide economies in higher quality, longer life, reduced maintenance, and lower inventories.

Special Lubricants Withstand High Heat, Are Fire Resistant

R. Q. Sharpe—Changes in processing and new product development move simultaneously and are often dependent upon cutting fluid improvements and the development of new lubricants and techniques. An example is the increased need

NEW Whiting Ladle Handler Lifts 100 lbs for Every Pound of Effort!

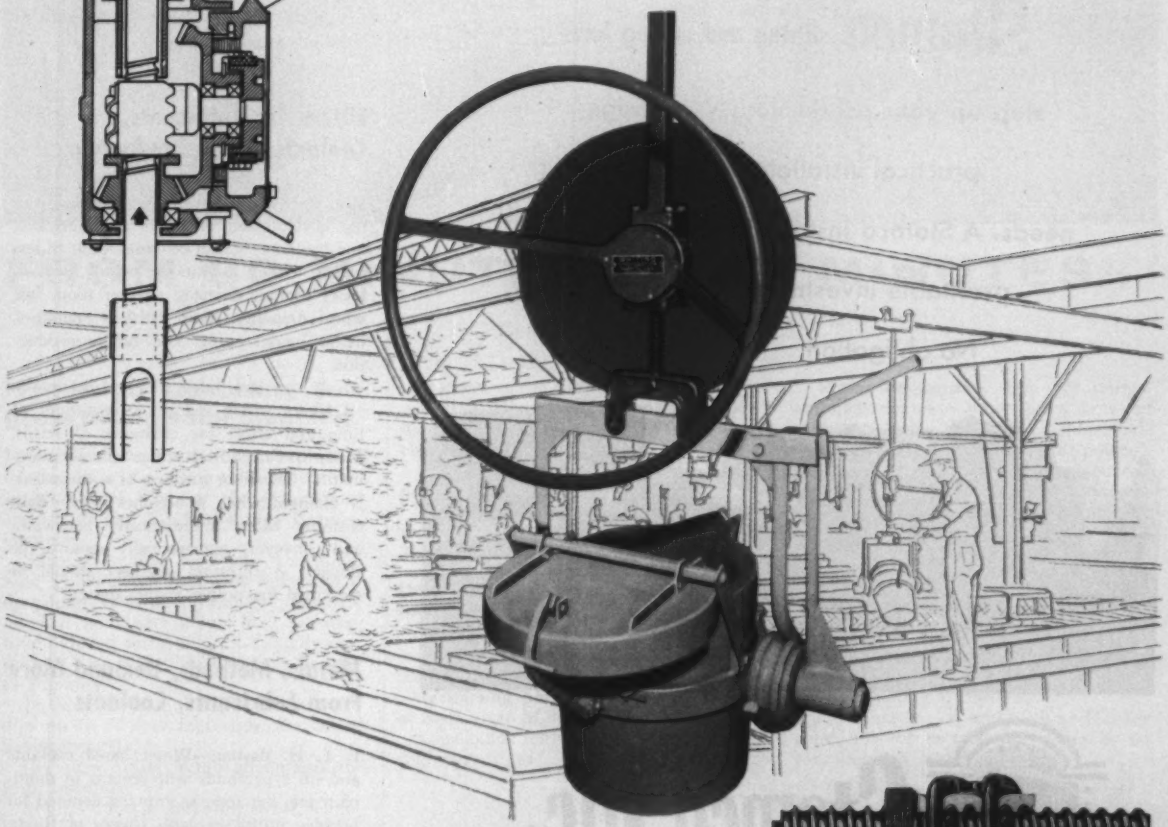


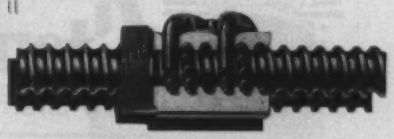
. . . made possible by the Saginaw b/b Screw!

The Whiting Corporation, heavy foundry equipment manufacturers, designed a ladle handler that lets the operator manually raise and lower a gross weight of over 2250 pounds with maximum ease and control. The Saginaw Ball Bearing Screw got the actuation job!

A turn of the handwheel on the new 'H-E' Ladle Handler transmits torque to the Saginaw Screw which converts *rotary* motion into *linear* motion with over *90% efficiency*. This, with a unique clutch-brake spring, helps the operator LIFT 100 POUNDS FOR EVERY POUND OF EFFORT, and maintain control at all times! The Saginaw Screw also provided savings in maintenance, wear, parts and weight.

The Saginaw Screw may be able to improve your product's performance and increase its sales acceptance. Write or telephone Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan—*world's largest producers of b/b screws and splines.*





A Size and Type for Every Need...

Have been built as small as 3/16 in. B.C.D. and 1½ in. long, as large as 6 in. B.C.D. and 40 ft. long. Larger sizes can be built to your order.

Saginaw

ball bearing Screw

WORLD'S MOST EFFICIENT ACTUATION DEVICE

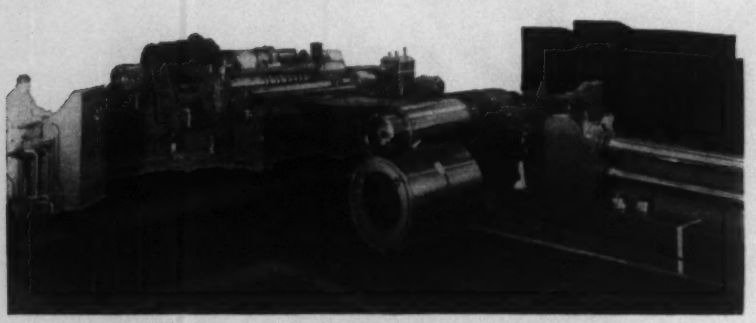
Lubrication

JOHN R. McCOY
Manager, Technical Service
Indiana Commercial Filters Corp.
Lebanon, Ind.

E. L. H. BASTIAN
Senior Engineer, Shell Oil Co.
New York

Stamco slitting and coiling lines

step up your production. We design practical installations, fitted to your needs. A Stamco installation is a profitable investment. Contact us today. No obligation.



Stamco, Inc.
New Bremen, Ohio, U. S. A.

Slitting and Coiling Lines • Cut-To-Length Lines • Flying Shear Lines • Power Squaring Shears • Automatic Resquaring • Corrugating, Culvert and Steel Mill Equipment

(in gas turbines and space vehicles) for metals capable of withstanding high temperatures. Special cutting and drawing lubricants are required. The use of fire resistant hydraulic fluids has been accelerated in presses utilizing high temperature dies.

In the automotive, aircraft, and agricultural implement fields, more semiautomatic or fully automatic machines are being used. They require high quality hydraulic fluids of almost surgical cleanliness. Such fluids call for the installation of micronic filters and greatly improved handling and maintenance procedures.

The greater use of synthetic, fire resistant fluids for compressor lubrication presents new problems in application and the design of application devices. Another expanding trend: Increasing interest in water-in-oil emulsions for fire resistant service.

Nonsoap greases are satisfactorily meeting an increasing number of high temperature requirements. The use of molybdenum disulfide for many specialized applications is continuing.

Filters for Lubricants, Coolants Boost Production

John R. McCoy—Gains are being made in the development of filters for lubricants and coolants. Clean coolants result in less rejects, closer tolerances, better finishes, fewer coolant changes, sharper tools, less wheel dressings, more satisfied operators, better housekeeping, and higher production.

You can get lubricant and hydraulic oil filters which require a minimum of time and effort for changing of refills. Many coolant filters are practically automatic. The filter medium is automatically changed when it becomes dirty. Self-cleaning filters automatically backwash, and conveyors automatically remove the sludge. A filtration engineer should be consulted for proper system design.

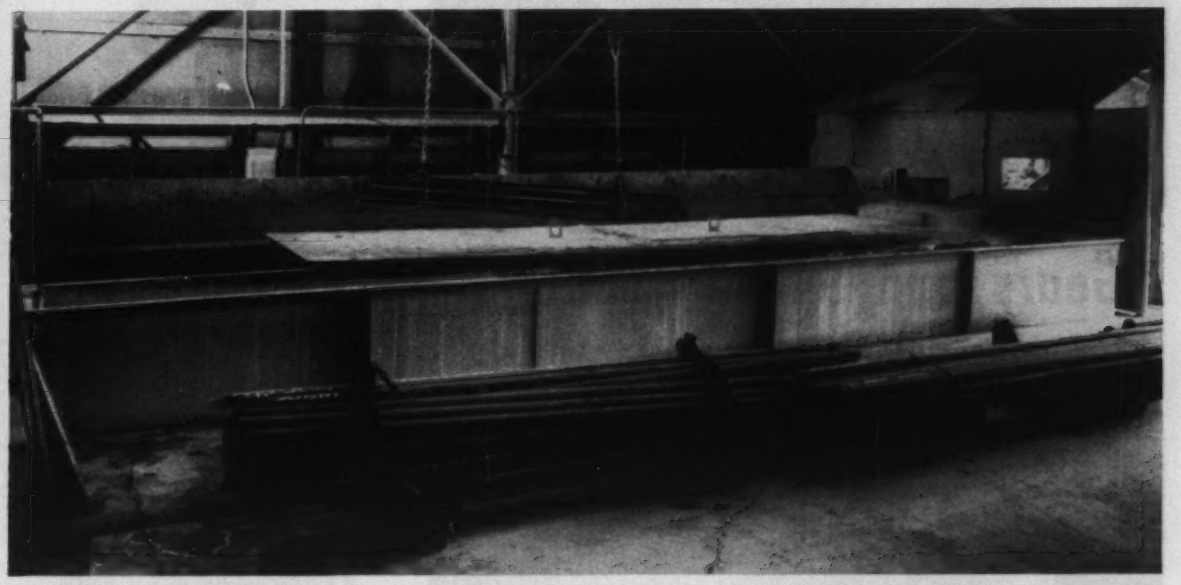
Metals, Methods, Demand More From Lubricants, Coolants

E. L. H. Bastian—Water based coolants and oil type fluids will remain in dominant use, but there is growing demand for broader utility in both classes of fluids.

Water based coolants must demonstrate lubricating properties to meet heavy duty machining needs and show better service compatibilities with machine tool systems (bearing lubricants, painted surfaces, and bearing materials). The development of improved, heavy duty soluble oils and solutions is evidence of user interest.

Newer oil type cutting and grinding fluids show a similar trend toward multiple use application not only for machin-

THE TIMKEN COMPANY CUTS DESCALING TIME



FROM 90 MINUTES TO 30 MINUTES

How Virgo® Descaling Salt gives faster, safer cleaning.

It used to take as much as ninety minutes of straight acid pickling to descale these stainless steel tubes at the Gambrinus Works of The Timken Roller Bearing Company.

Since switching to Virgo Descaling Salt, The Timken Company reports that descaling cycles have been cut down to *one-half* hour with actual acid pickling time reduced to 10 minutes. Equally important too, is the improvement in surface quality.

In the same bath, which handles bundles up to 37 feet in length, the tubes are degreased.

Get these other Virgo advantages in your descaling:

Besides stainless and alloy steels, Virgo Descaling Salt descales titanium and its alloys. You can even handle both types of metal in the same bath.

Virgo Salt reacts only with scale. There's no loss of base metal, no pitting or etching. There's no danger of hydrogen embrittlement.

The Virgo bath is safe and simple to operate, using normal precautions. Bath temperatures run from 800 to 1250°F.

You can descale strip, sheet, bars, wire, tubes, castings, or any other form to a chemically clean surface.

You use much less acid with the Virgo process.

For more information on how Virgo Descaling Salt works, write for Bulletins 25 and 25-T (Titanium).

Help for your other metal cleaning operations.

Desanding. Use Virgo Electrolytic Salt to remove sand, graphite, other impurities—produce a chemically clean surface.

Reclaiming parts loaded with carbon or rust. Virgo Molten Cleaner works fast—is the quick answer for large-scale salvage operations.

Vapor degreasing. You get unique stability—degrease more parts between cleanouts—using Nialk® *Trichlor*ethylene with *psp* (permanent staying power).

Stripping, acid neutralizing. You can get Hooker caustic soda in four convenient flake sizes, in new easy-to-empty drums with 18" openings.

Acid cleaning, pickling. You can get Hooker muriatic acid in 4,000-, 6,000- or 8,000-gallon tank cars.

Plating with tin-zinc, tin, silver, copper. Get the benefit of more than 50 years' experience in potash production, when you specify Nialk® caustic potash for your plating operations.

For literature on any of these Hooker chemicals for metals, just write us on your business letterhead.

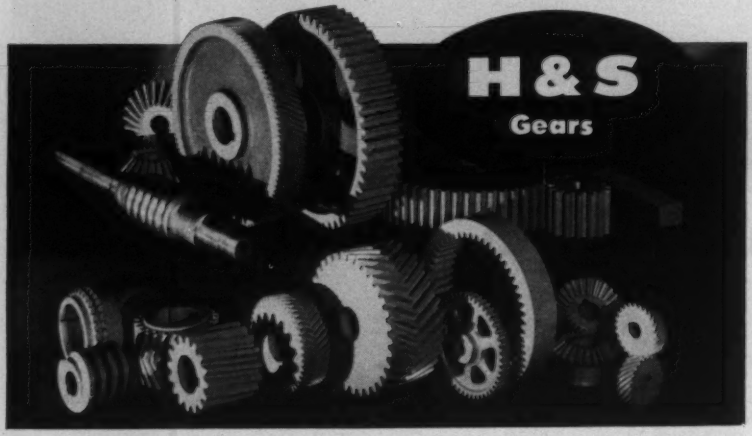
HOOKER CHEMICAL CORPORATION

1201 Union Street, Niagara Falls, N. Y.

HOOKER CHEMICALS PLASTICS

Sales Offices: Chicago, Ill.; Detroit, Mich.; Los Angeles, Calif.; New York, N. Y.; Niagara Falls, N. Y.; Philadelphia, Pa.; Tacoma, Wash.; Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B. C.

Gears and Speed Reducers
for your power transmission needs



H & S offers a complete line of Speed Reducers. Single, double and triple reduction types using Herringbone and Helical gears provide ratios from 2.31 to 1 up to 429 to 1; Worm gear reducers' ratios range from 3.56 to 1 up to 10,000 to 1. H & S has also become a leader in engineering and building special drives with space- and cost-saving features.

Industrial Gears, large or small, backed by over 70 years experience: Spur Gears up to 160" dia.; Spur Racks up to 12 ft. long; Helical Gears up to 125" dia.; Sykes Herringbone, up to 60"; Straight Bevel, up to 77"; Worm Gears up to 60" dia.; Sprockets, up to 48" dia. H & S Gears are available in Steel, Cast Iron, Ductile Iron, Bronze, Rawhide, Fibroil, or Bakelite.

Send for Speed Reducer Catalog No. 55, Gear Catalog No. 57.

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 Hamilton Avenue • Cleveland 14, Ohio

Lubrication

EDMOND E. BISSON
Assistant Chief, Fluid Systems Div.
Lewis Research Center, National
Aeronautics & Space Administration
Cleveland

ing requirements but for lubrication service in the machine tools themselves.

Metals with physical properties at the extreme limits of machinability have intensified performance demands on cutting oils.

They complicate the problem of developing fluids that are noncorrosive to bearing materials and reasonably compatible with other elements in machine tools. Progress in this field will undoubtedly continue through next year.

Solid Lubricants Resist Low and High Temperatures

Edmond E. Bisson—High temperatures in operating mechanisms have placed important requirements on the lubricants, including thermal stability and chemical inertness.

Solids such as molybdenum disulfide and graphite will continue to be mainstays. At higher temperatures (1000° F) lead monoxide may be effective.

Solid lubricants can be applied as loose powders, but a bonded film may be required under difficult conditions.

For high temperatures, ceramic binders such as silicon dioxide are necessary for effective lubrication. Combined with lead monoxide, silicon dioxide can be effective at 1250° F.

Teflon is a solid type lubricant that is inert to many chemicals. It may be useful for the low temperature range (−300° F to −423° F).

Die lubricants of glass or glass forming materials are coming into the picture because of their ability to lubricate at high temperatures. (They form soft, viscous films.)

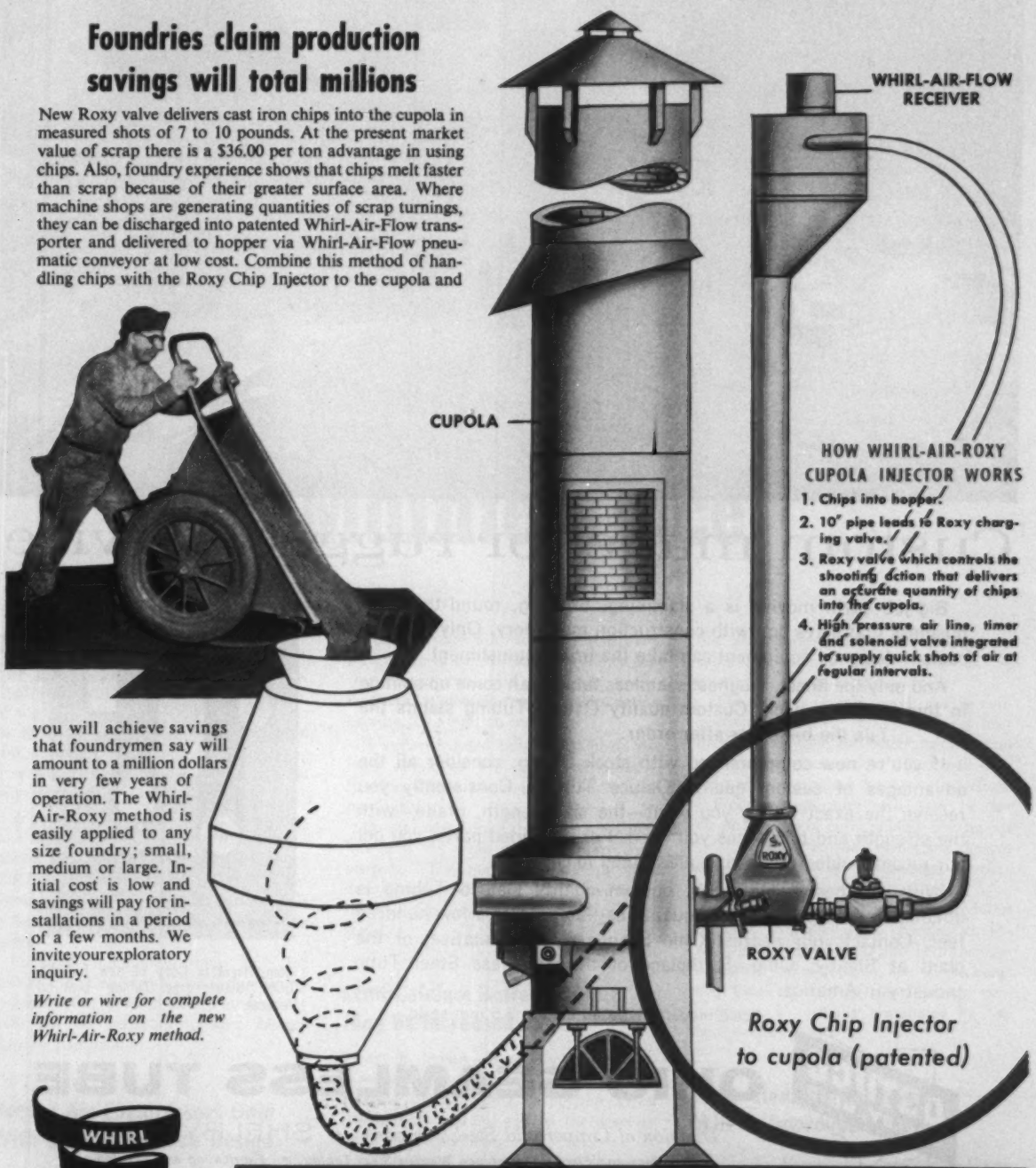
SAVE $36.00 a ton on cast iron chips

New Whirl-Air-Roxy method delivers chips from Machine Shop to Cupola *(patented)*

Foundries claim production savings will total millions

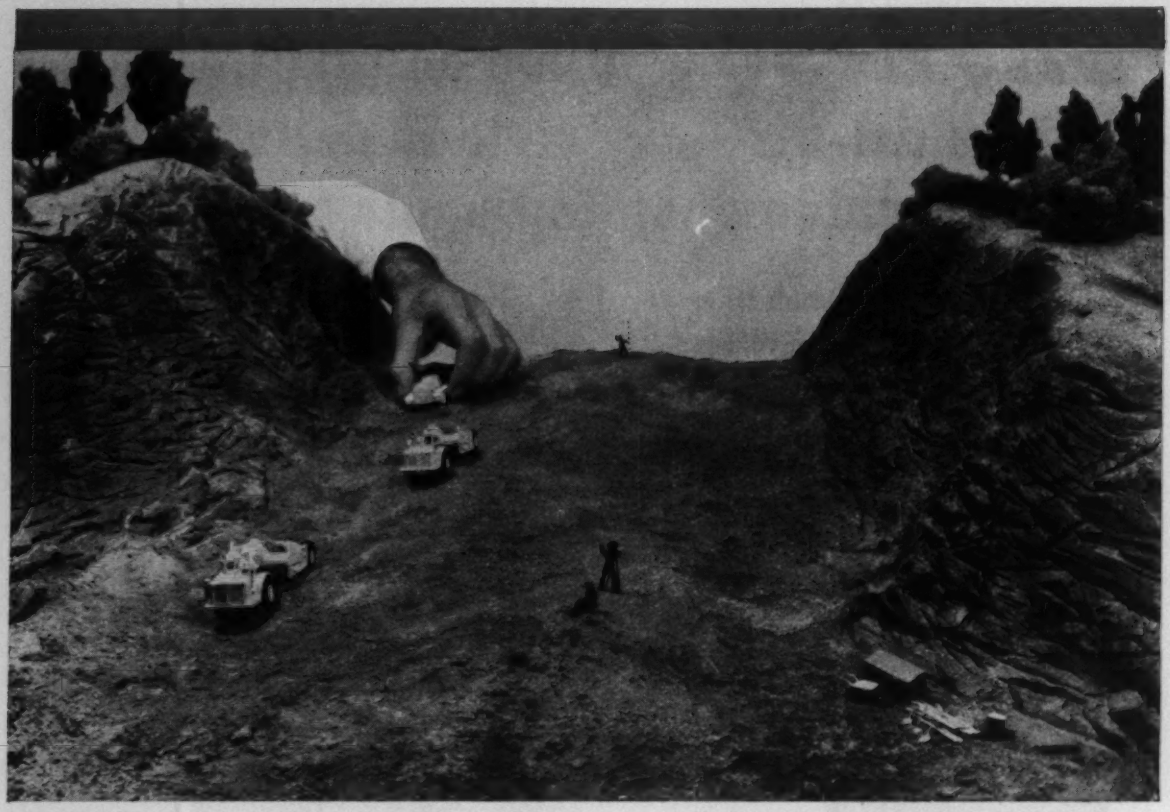
New Roxy valve delivers cast iron chips into the cupola in measured shots of 7 to 10 pounds. At the present market value of scrap there is a $36.00 per ton advantage in using chips. Also, foundry experience shows that chips melt faster than scrap because of their greater surface area. Where machine shops are generating quantities of scrap turnings, they can be discharged into patented Whirl-Air-Flow transporter and delivered to hopper via Whirl-Air-Flow pneumatic conveyor at low cost. Combine this method of handling chips with the Roxy Chip Injector to the cupola and you will achieve savings that foundrymen say will amount to a million dollars in very few years of operation. The Whirl-Air-Roxy method is easily applied to any size foundry; small, medium or large. Initial cost is low and savings will pay for installations in a period of a few months. We invite your exploratory inquiry.

Write or wire for complete information on the new Whirl-Air-Roxy method.



WHIRL AIR FLOW PNEUMATIC CONVEYORS

WHIRL-AIR-FLOW



Custom made for rugged service

Big-job earth moving is a slamming, bruising, round-the-clock business that plays hob with construction machinery. Only the best custom-designed equipment can take the brutal punishment.

And only the finest, toughest seamless tubing can come up smiling in this rugged service. Custom quality Ostuco Tubing stands the gaff . . . fills the bill order after order.

If you're now compromising with stock tubing, consider all the advantages of custom quality Ostuco Tubing. Consistently you receive the exact tubing you want—the size, length, grade—with the strength and tolerances you need. For machined parts, you get our recommended rough size guaranteed to clean up.

With all these advantages, custom quality Ostuco Tubing is obtainable in small minimum quantities—as little as a few hundred feet. Contact your nearest Ohio Seamless representative, or the plant at Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry in America.

A-1282A

Scale model illustrated built to 3.5 mm scale.

Complimentary Copy of new Bulletin CS60 "Ostuco Steel Tubing" sent on request.

OSTUCO SHELBY, OHIO

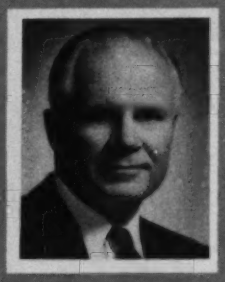
OHIO SEAMLESS TUBE

Division of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Miami, Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, Salt Lake City, Seattle, Tulsa, Wichita

[illegible] Railway & Power Engr. Corp., Ltd. — EXPORT: Copperweld Steel International Company, [illegible], New York 7, New York



WALTER E. MORGAN JR.
Vice President
Walter Kidde & Co. Inc.
Belleville, N. J.

CHARLES E. FLORA
Manager of Industrial Sales
Davey Compressor Co.
Kent, Ohio

HENRY E. JENSEN
Vice President
C & D Batteries Div.
Electric Autolite Co.
Conshohocken, Pa.

ORVILLE C. HOGNANDER
Vice President
G. H. Tennant Co.
Minneapolis

1960 FORUM ON TECHNICAL PROGRESS

Service and Maintenance

Temperature Control Vital For Automated Processes

Walter E. Morgan Jr.—The growing trend to automation calls for more advanced fire detection techniques. But detecting overheat and underheat in automated processes is even more important.

Zone detection will be used instead of spot detection, and detectors will be connected to recorders to show temperature buildup toward a danger point. Continuous or zone detection will automatically keep processes in the correct operating range.

Increased automation may call for greater use of automatic fire extinguishing systems. But technological improvement may not be necessary—present designs may be adequate.

Rotary Air Compressors Gain With Improved Blade Design

Charles E. Flora—Oil cooled rotary compressors will gain greater industrial acceptance in 1960.

Rotary compressor design has reached a high standard of reliability. Many compressed air users are turning to the rotary because it offers constant air flow, low cost installation, and low cost maintenance. It doesn't require a foundation because it's vibration-free.

A surface treated light metal blade has been developed for rotary compressors. It offers longer life than any blade used previously.

Questionable life of the vanes, or blades, has been the weak point in rotary compressors. The material previously used deteriorated and broke under extremely heavy loads, damaging the rotor and stator.

Lead-Calcium Battery Output May Be Increased 25%

Henry E. Jensen—More efficiency for industrial lead-acid storage batteries, made possible by increasing output for given weight and volume, will be the development goal this year.

Efficiency of the lead-calcium, lead-acid storage battery (for diesel starting, control, and communications) will be boosted by increasing the specific gravity of the electrolyte. In that type, specific gravity of the electrolyte can be increased without shortening battery life. Output of some lead-calcium batteries may be increased as much as 25 per cent.

The amount of grid metal used in conventional batteries (to assure long life) may be reduced by better casting and quality control methods. That will provide additional space for active materials.

Product uniformity will also be increased by use of more reliable, continuous (and often automatic) measuring devices that will check all components as they are fabricated.

Automatic, silicon equipment, introduced recently, will also boost charging equipment efficiency. It will also help increase industrial storage battery life. Overcharging, long a cause of poor battery performance, is virtually eliminated by the new devices.

Floor Cleaning Techniques Will Be Improved in '60

Orville C. Hognander—Superclean floors will typify maintenance progress in 1960. The performance of sweepers and floor cleaning machines will be improved, and many units will be mechanized.

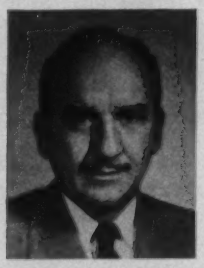
A year ago, 94 to 96 per cent pickup

Service and Maintenance

JOHN T. RYAN JR.
President
Mine Safety Appliances Co.
Pittsburgh

C. D. WRIGHT
Supervising Engineer
American Air Filter Co. Inc.
Louisville

H. W. RAINEY
General Sales Manager
Sturtevant Div.
Westinghouse Electric Corp.
Boston



H. L. RICHARDSON
Sales Manager, Pittsburgh District
Research-Cottrell Inc.
Bound Brook, N. J.

efficiency in vacuum sweeping was considered excellent. A sweeper under development has a 99 per cent rating. Its vacuum filter removes particles as small as 5 microns. The remote guidance unit can be started, stopped, speeded up, slowed down, turned, and dumped by radio signals. (Television cameras are the sweeper's "eyes.")

Battery powered sweepers will be used more in congested areas. Larger battery powered units have been used for several years, but battery size and weight have slowed the development of smaller ones.

Development of more powerful vacuum systems has stimulated interest in small sweepers that use only a pair of truck type batteries. The machines are said to eliminate much handwork and help control airborne dusts in toolrooms and precision instrument assembly areas.

Other trends: Increased standardization of floor maintenance equipment and adoption of rigid cost control systems.

Safety Minded Management Keeps Pace with Progress

John T. Ryan Jr.—Technological progress in any industry must be accompanied by safety equipment and programs to meet new hazards.

Safety consciousness has kept up with technical advances in metalworking. The hard hat symbolizes its safety mindedness. In many plants, 100 per cent head protection is the goal. The safety equipment manufacturer is keeping pace with the program by developing hats to protect workers against any conceivable hazard.

Instrumentation for heat treating processes is basically analytical, but precision instruments have been developed to guard against fire hazards.

Expansion of the metalworking industry into chemical byproducts makes toxic or combustible gases a problem for a safety-minded management. The activity has led to the development of instrumentation to monitor the gases continuously.

The industrial hygiene engineer is a key man in the safety program of a metalworking plant. He will need more versatile equipment for noise analysis and protection. He will also need tools for detection of air-borne toxic materials and protection from them.

Filtering and Precipitation Will Gain Popularity

C. D. Wright—Electrostatic precipitators and high efficiency mechanical filters will gain popularity in the sixties. Air filter designers will continue to develop more effective units that require less maintenance.

Air pollution boards and smoke abatement committees will put more pressure on companies that melt or refine metal. In a few years, we may treat air the way we're now treating water. It will be purified before it's used and decontaminated before it's released. Equipment being tested shows promise.

Specialized dust control equipment is being used successfully on open hearth furnaces. Wastes from iron melting cupolas are collected with centrifugal devices.

Present and proposed air pollution requirements may render some types of dust collectors unsuitable for sintering plants. They may be replaced by wet collectors.

Electrical and mechanical rolling mill accessories (which will increase efficiency, make for more accurate control, and permit a greater degree of automation) must have clean air for reliable operation.

Wet machining, replacing dry machining on many operations, increases tool life and reduces dust generation, but it creates a serious oil mist problem. The mist can be collected effectively by electronic precipitators, oil bath dust collectors, or dry type filters that use a high efficiency, spun glass filter medium.

Balanced Plant Ventilation Expected to Gain in 1960

H. W. Rainey—More emphasis will be placed on balanced ventilation for industrial plants in the immediate future. The practice has been gaining acceptance, particularly in new installations. It also has great potential in present facilities.

Balancing of exhaust air with equal or greater quantities of makeup air prevents excess infiltration from outside the ventilated areas. It often saves the cost of supplementary air heating or cleaning equipment. Axial pressure fans are being used more for introduction of makeup air. Combined with package units and the right distribution equipment, they produce makeup air economically and efficiently.

Higher quality control standards make the air cleaning aspect of ventilation systems more important. Electronically cleaned air reduces the number of items rejected because of poor appearance. Clean air offers savings in plant and machine maintenance and in employee well-being.

Gas Cleaning Methods Improve With Steelmaking Technology

H. L. Richardson—The gas cleaning industry is ready to solve most air pollution problems.

Technical progress in the steel industry will be accompanied by improvements in gas cleaning methods.

Increased use of oxygen in steelmaking increases the importance of air pollution

STRIPPIT SUPER 30 FABRICATOR

Larger work sizes for more efficiency...for short run punching — 30" x any length ... for production run hole duplication — 25" x 30".

Adjustable table for greater accuracy and flexibility...for punching to closer tolerances in angles, shapes and formed parts as well as flat sheets.

New, no-jam electric head eliminates down time...and the need for pressurized air. Fewer parts minimize maintenance — ensure quieter, more positive operation.

Wide range of hole punching capacities...from a 3½" hole (round or shaped) in 16 gauge to a ½" hole in ¼" mild steel.

Corner and edge notching...up to 5" x 5" in 16 gauge mild steel — 90° corners, rectangular, vee, radii and special shape edge notches.

Straight line nibbling and contour shearing...at 165-strokes per minute in ⅛" mild steel. Instant changeover from single stroke punching.

New swing-shift punch holders...quick-opening, positive-closing — for right or left-hand operation. Electrical interlock for safety.

Exclusive quick-change tooling system...using standard stock punch and stripping guide assemblies and die buttons. Size changes take less than 20 seconds.

New quick-set gauging system...with micrometer settings for fast, accurate layout and rapid work positioning.

EASY CONVERSION TO A PRODUCTION PUNCHING UNIT...

with the Strippit Duplicator which can be built-in as an integral part of the Super 30 Fabricator — and the Dupl-O-Scope for punching Duplicator templates from a drawing, layout or sample part.

WRITE TODAY... for complete details, illustrated literature, price and delivery.

A UNIT OF HOUDAILLE INDUSTRIES, INC.

WALES **STRIPPIT** INC.

210 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ont.

Service and Maintenance

W. O. VEDDER
Vice President
Pangborn Corp.
Hagerstown, Md.

C. H. GALLAWAY
Vice President
Safety Products Div.
American Optical Co.
Southbridge, Mass.

R. T. PRING
Technical Director
Dust & Fume Control Div.
Wheelabrator Corp.
Mishawaka, Ind.

A. R. CORLETT
Executive Vice President
Cathodic Protection Div.
Harco Corp.
Cleveland

control. Development of the basic open hearth roof coincided with serious efforts of steelmen to clean furnace gases, and oxygen lancing has made the gas cleaning job more difficult. But the problem is in economics rather than technology. Gas cleaning equipment, ready for use in oxygen steelmaking, can prevent waste of charge material. Production of 5 or more ingot tons of steel a minute is no problem, but as much as 2 per cent of the charge weight is often discharged in the combustion gases.

The sinter plant, once a scavenging unit, is now used for ore preparation. It has presented some new gas cleaning problems, but they are being solved. Higher blast furnace top pressures have led to the development of high pressure drop cleaning methods. Use of gas turbines for blowing may reverse the trend. Low pressure drop cleaning, without decompression, will then be necessary.

Filtermakers Challenged By Air Pollution Problem

W. O. Vedder—Makers of industrial fume and dust control equipment will help industry meet more stringent air pollution laws in the sixties.

Control of effluents from melting furnaces, smelters, converters, kilns, dryers, roasters, and coolers is getting special attention. The job is complicated by high temperatures. Variations in gas volume and temperature, dust loadings, and constituents also present problems, and the gases contain fine particles that are difficult to collect.

Basic antipollution equipment has been improved and modernized to increase over-all effectiveness; application ranges have been extended; operating and maintenance costs have been reduced. Equipment has been modified to handle problems that involve higher loading, finer particles, and elevated temperatures. Several novel modifications have progressed to full scale operation.

Synthetic fibers have extended the applicability of fabric collectors. They offer a degree of particle recovery that couldn't be justified previously because of cost. Collectors designed to use glass fiber filters and improved fabrics have made fabric units suitable for jobs they couldn't do before.

Increased Activity Expected In Safety Equipment Field

C. H. Gallaway—New safety products will meet the challenge of industry in 1960, offering complete protection for the industrial worker's eyes, head, face, body, and respiratory system.

Rising employment and increasing accident prevention activities by management will increase the demand for safety equipment.

Changes in metalworking and chemical manufacturing processes will create new hazards for workers and call for new safety devices.

Manufacturers and safety equipment specialists will work together to develop the necessary equipment.

Cost of Pollution Control Expected to Drop in 1960

R. T. Pring—Improved gas cleaning equipment promises to reduce the cost of preventing air pollution in steel mills. Glass bag filters are expected to help the steel industry clean up its stacks in the sixties.

Treated glass filter fabrics almost clean themselves. They require only gentle flexing by reverse air flow to remove fumes and dust, maintaining stable resistance levels with high efficiency. Filters operating at 550° F, without mechanical bag shaking devices, will be attractive in terms of cost, simplicity, and efficiency.

The first commercial setup used to clean water cooled gases from an electric steel furnace (with shell tap furnace evacuation) will soon finish its first year of operation. Pilot units are being used on cold charge open hearths at two western steel plants. Another company is using a pilot unit on a hot charged open hearth.

Three basic oxygen converters, all using electrostatic precipitators, will go into operation in 1960.

Greater use of oxygen in open hearths and the increasing acceptance of basic oxygen converters call for the best in pollution control equipment.

Cathodic Corrosion Control To Cut Material, Labor Costs

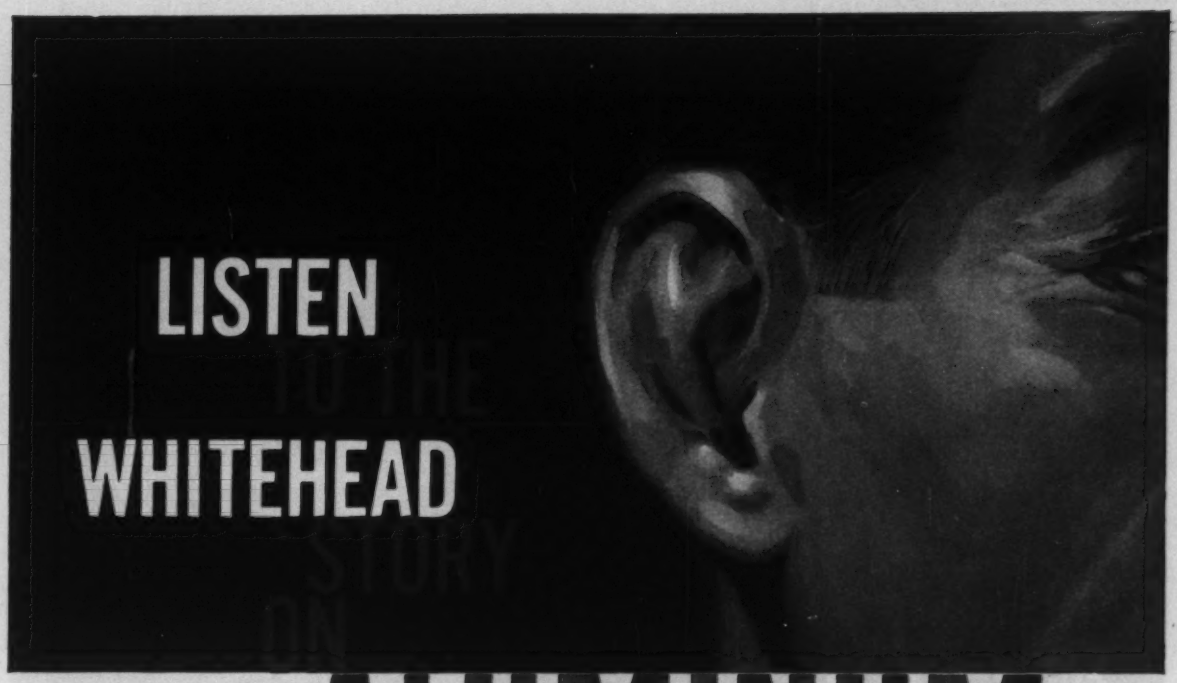
A. R. Corlett—The cathodic protection industry will continue to grow.

Increasing costs of materials and labor force industry to find a way to prevent corrosion of buried or submerged steel structures, instead of replacing at regular intervals.

Cathodic protection, or electrical corrosion control, meets that need.

Oil and gas pipeline companies were early to recognize the value of cathodic protection for corrosion control of underground piping.

They found that with adequate coating and cathodic protection, thin wall pipe could be used. Savings in material alone paid for the coating and cathodic protection. Longer life and interruption-free service made the method attractive. Elimination of hazards or property damage caused by leaks in oil or



ALUMINUM

Full and complete stocks—
Technical help to meet your needs

The Whitehead service story on Aluminum is unusual. It accommodates the engineer who requires technical help in the planning stage. Then, too, the manufacturer or fabricator who requires the supplementary items—welding rod and fasteners to go with sheet; fittings and valves for the pipeline; etc. Truly a one-stop service from Alcoa's largest distributor in metals and technical help in the East.

Stocks of over 700 sizes of rod, pipe and tube; almost 500 items of sheet; thousands of fasteners and even 18 sizes of a specialty item like tool and jig plate, make Whitehead a true "Supermarket" of aluminum, no matter what your requirements.

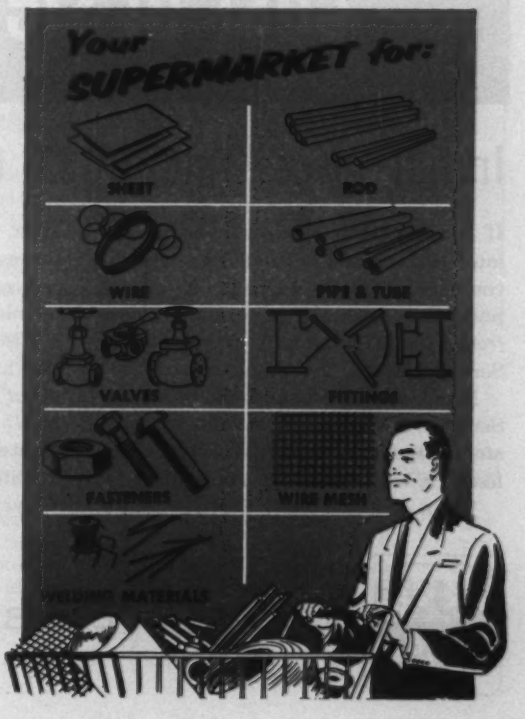
Since we stock all the principal corrosion resistant materials—Copper Alloys, Brass, Bronze, Clad Metals, Stainless Steel, Monel, Inconel and Plastics, too—we can and do give unbiased opinions on the right material to do the job. Anytime you need anything in the corrosion resistant line, you'll find it pays to call Whitehead first.

Call WHITEHEAD METALS *First!*

WHITEHEAD METALS, INC.

303 WEST 10th STREET, NEW YORK 14, N. Y.

Other offices and warehouses: **PHILADELPHIA • BUFFALO • HARRISON, N. J. • CAMBRIDGE, MASS. • SYRACUSE • BALTIMORE • ROCHESTER • WINDSOR, CONN.**



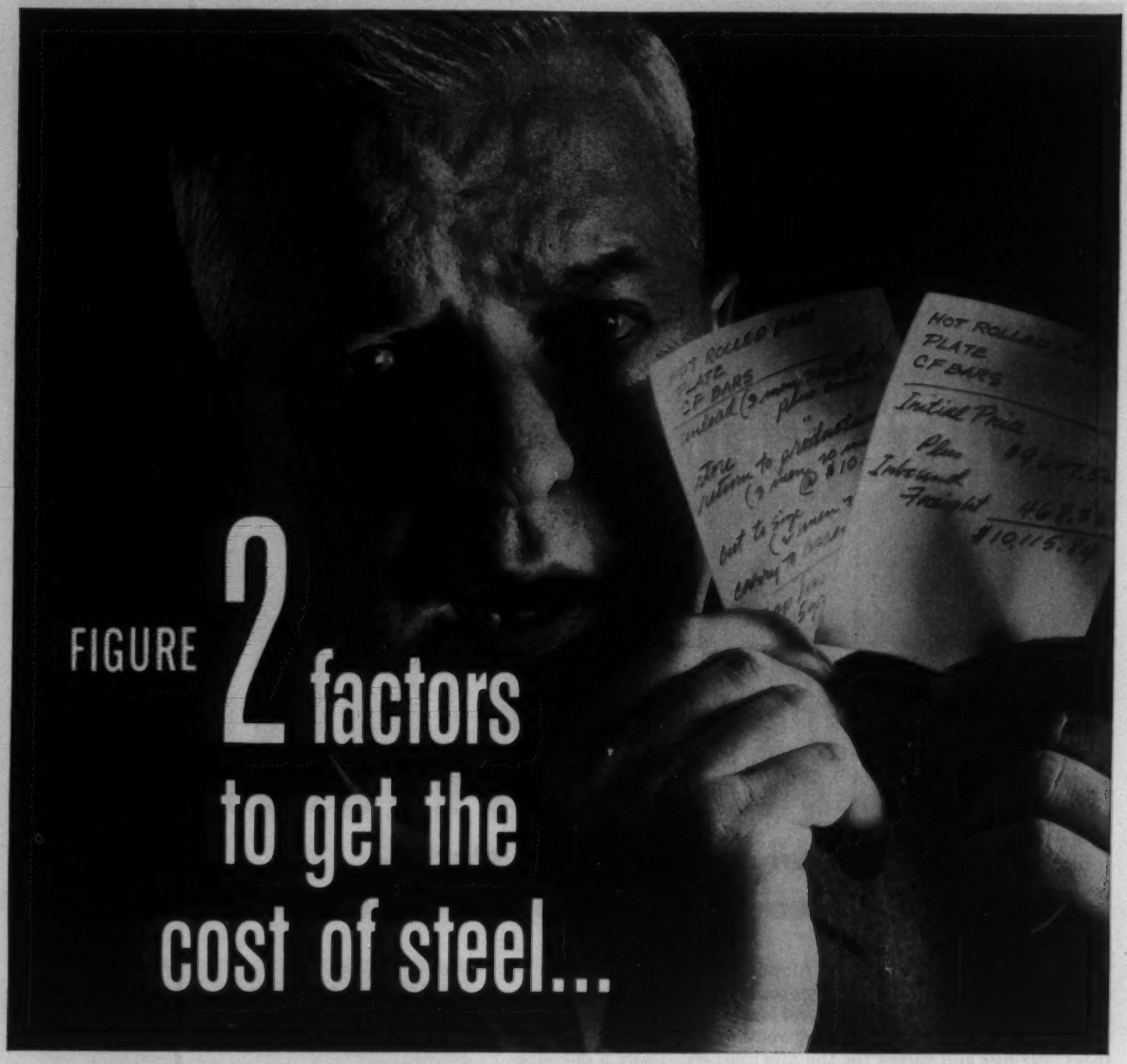


FIGURE 2 factors to get the cost of steel...

Initial price! And COST OF POSSESSION!

If you're putting steel in inventory for later use because you think it's a bargain, compare all your costs, including cost of possession, with the price and *freedom from risk* of buying from your Steel Service Center.

Many steel users have found that using Service Center steel saves expensive storage space and saves the costs of obsolescence, waste, handling and cutting.

When you use Steel Service Center labor and equipment for preliminary processing, you save both the investment and operating expense of having your own labor and equipment.

Use the chart to figure all your costs. For more information, get the booklet, *What's Your Real Cost of Possession for Steel?* Ask your nearby Steel Service Center. Or write to Steel Service Center Institute, Inc., 540-G Terminal Tower, Cleveland 13, Ohio.

COST OF POSSESSION FOR STEEL IN YOUR INVENTORY

Per ton delivered	_____
Cost of capital:	
Inventory	_____
Space	_____
Equipment	_____
Cost of operation:	
Space	_____
Materials handling	_____
Cutting & burning	_____
Scrap & wastage	_____
Other costs:	
Obsolescence	_____
Insurance	_____
Taxes	_____
Accounting	_____
TOTAL	_____

COST OF FREEDOM-FROM-RISK STEEL FROM YOUR STEEL SERVICE CENTER

Per ton, cut-to-size, and delivered

TOTAL _____

STEEL SERVICE CENTER INSTITUTE

...YOUR STEEL SERVICE CENTER

gas lines encouraged acceptance of cathodic protection.

Chemical process plants and many manufacturing companies recognize the economic advantage of cathodic protection. Underground piping, fire protection tanks, sheet steel bulkheads, and piers are being protected by the cathodic method.

New materials, new techniques, and increased technical knowledge in the field of corrosion engineering have led to new applications and made cathodic protection more effective and more economical. New applications are being made in the gas transmission and distribution field. Coating manufacturers, who once considered cathodic protection a competitive threat, now advise the use of coatings and cathodic protection for maximum corrosion prevention at minimum cost. Steel producers and fabricators also recognize the value of cathodic protection.

Industrial Fire Protection Requires Custom Systems

Wayne E. Ault—Tomorrow's fire protection problems are here today. Each must be studied: No one solution can be offered for a group or class of problems. Equipment and systems must be specially designed, installed, and maintained.

Fire protection systems will be designed as a part of production processes. Feasibility studies are being made, and equipment is being designed under research and development contracts. Special systems will be produced and installed by fire protection companies that use the research and development approach.

Automatic fire extinguishing systems were developed in the early 1800s. In one early system, a gunpowder impregnated cord activated a water deluge valve.

Today's industry uses standardized fire alarms, automatic sprinkler systems, and automatic carbon dioxide, dry chemical, or foam systems. Tomorrow's new hazards must be met with new fire protection techniques.

New chemical processes, new chemical storage problems, and new high speed machinery must be given adequate hazard protection. Insurance premiums may not pay for the loss of 1 lb of an exotic material, or the loss of a day's profits. And companies can't always retain skilled workers or customers while plants are being rebuilt.

Better Coatings Are Needed To Reduce Pipeline Upkeep

N. T. Shideler—Oil and gas transportation companies will continue to look for ways to cut the material and installation cost of pipelines in the sixties. Many engineers advocate thinner pipe walls. They will make underground corrosion protection more important and lead to the development of better coatings.

For nearly 50 years, coal tar coatings have been standard, but they're too soft for good protection with today's increased pipe size, greater weight, and operating temperatures up to 200° F near the pumping station.

A perfect coating can't be developed, so coatings are being supplemented with cathodic protection (current is applied to the pipe to neutralize corrosion forces). Cathodic protection of hot pipelines is expensive when a large portion of the pipe surface is bared.

Newer coatings include vinyl and polyethylene tapes, extruded polyethylene coating, and coal tar-epoxy resin coatings. Today's polyvinyl and polyethylene tapes can't stand high operating temperatures. They are often distorted by soil, damaged in construction, or punctured by sharp stones and other materials in the pipe trench and back fill. Coal tar-epoxy resin coatings present some application difficulties; they may not survive expected life of the pipeline in hot temperatures.

Coal tar, hot applied coatings will remain popular for several years. But researchers will continue to look for a satisfactory coating (probably synthetic) that can be applied at the mill. It will be tough, flexible, and water resistant; it will have a high temperature resistance (up to 300° F); it won't be affected by cathodic protection; it will be able to stand rough handling, soil stress, and back fill operations; and it will permit thinner walled pipe to be used. Coatings will probably be reinforced to add strength to the pipe; they'll be applied inside and outside the pipe.

Better Protective Coatings Broaden Steel Application

W. E. Kemp—Protective coatings will find still wider use in 1960, and more special coatings will be developed for unusual applications.

Improved application methods permit the use of many materials that weren't practical in the past. Examples: Fusion of polyethylene to steel, making a strong bond without adhesives, and the application of chemically cured coal tar epoxy coatings to steel pipe at production rates.

The fluid bed coating of intricate objects with solid epoxy resins continues to find favor in many industries.

Airless spray equipment for the application of solventless, chemically cured coatings has been improved considerably.

Application of plastics to steel at the mill continues to gain popularity, making steel products more usable in corrosive areas. And coatings applied over low alloy steels and galvanized surfaces are getting more attention.

Service and Maintenance

WAYNE E. AULT
Manager, Engineering
Automatic Sprinkler Corp. of America
Youngstown

N. T. SHIDELER
Manager, Protective Coatings Research
Pittsburgh Coke & Chemical Co.
Pittsburgh

W. E. KEMP
Technical Director, Coatings
Tar Products Div.
Koppers Co. Inc.
Pittsburgh

In the next few years, more durable goods will be fabricated from mill coated material.

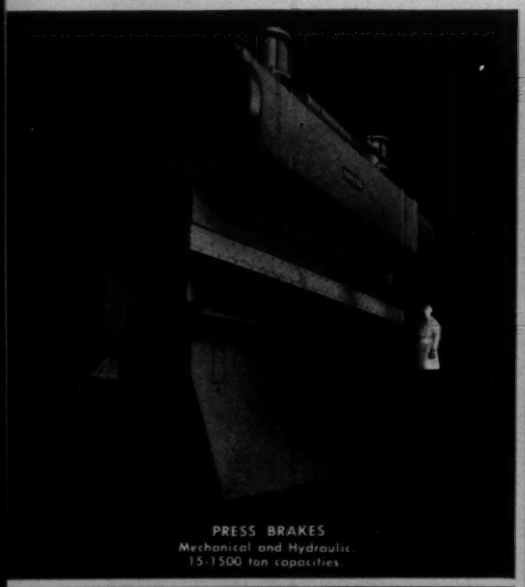
Yard application of chemically set protective coatings to steel pipe, structural members, and piling will also increase as new and efficient equipment becomes available.

Surface treatment and steel quality are important factors in coatings. Corrosion

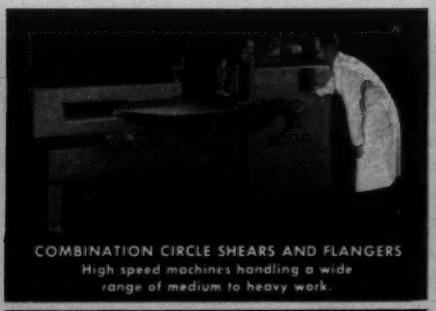
(*Please turn to Page* 340)

In plate or sheet metalworking...

NIAGARA MACHINES CAN

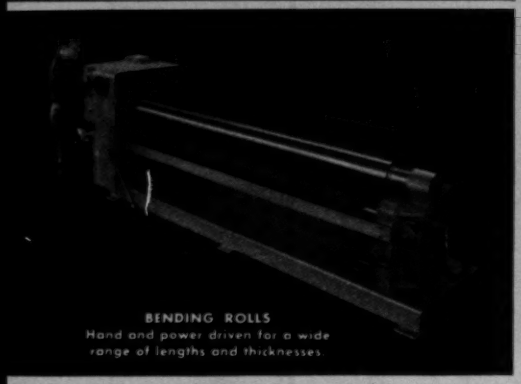


PRESS BRAKES
Mechanical and Hydraulic.
15-1500 ton capacities.

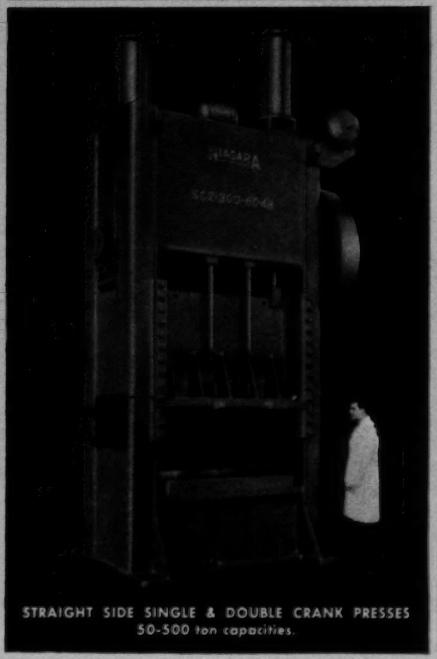


COMBINATION CIRCLE SHEARS AND FLANGERS
High speed machines handling a wide range of medium to heavy work.

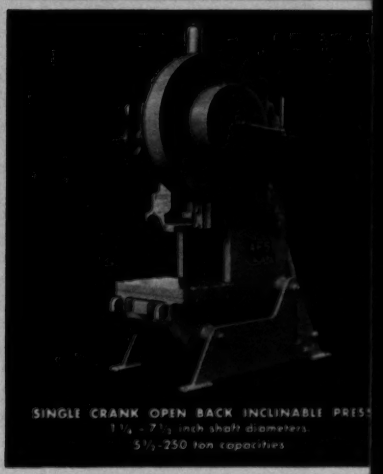
GAP FRAME DOUBLE CRANK PRESSES
3 - 6½ inch shaft diameters.
48 - 222 ton capacities. Also, inclinable series



BENDING ROLLS
Hand and power driven for a wide range of lengths and thicknesses



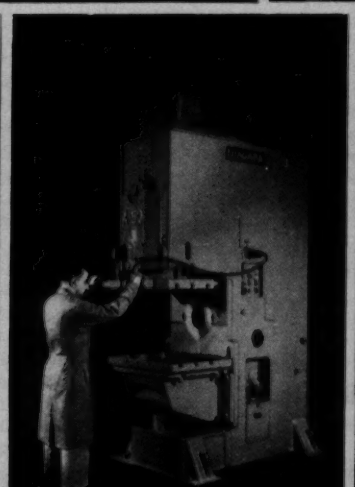
STRAIGHT SIDE SINGLE & DOUBLE CRANK PRESSES
50-500 ton capacities.



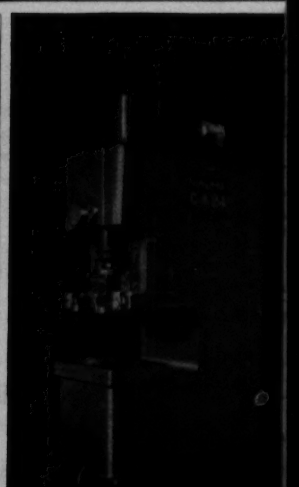
SINGLE CRANK OPEN BACK INCLINABLE PRESS
1¼ - 7½ inch shaft diameters.
5½-250 ton capacities

STRAIGHT SIDE ECCENTRIC GEARED PRESSES
One, two, and four-point suspension.
100-1250 ton capacities.
Standard and equipped for automation.

FRONT-TO-BACK CRANKSHAFT
OPEN BACK INCLINABLE PRESSES
Standard and automation models.
45-200 ton capacities.

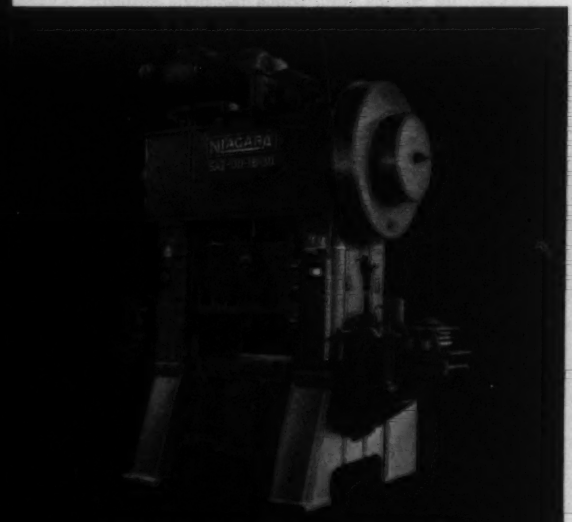


FRONT-TO-BACK CRANKSHAFT
ADJUSTABLE BED PRESSES
Standard and modified models.
22-150 ton capacities.

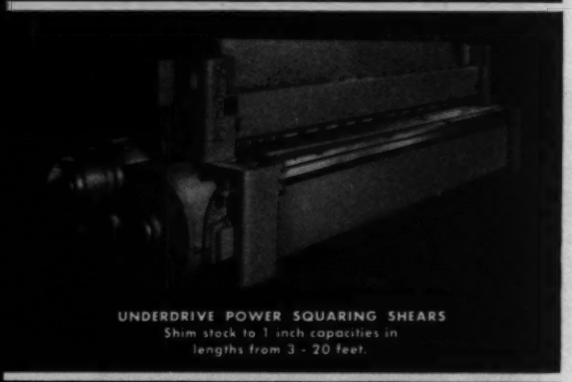


FRONT-TO-BACK CRANKSHAFT
DEEP THROAT PRESSES
22-150 ton capacities

DO THE MOST* FOR YOU



AUTOMATIC FEED HIGH PRODUCTION PRESSES
60-300 ton capacities.



UNDERDRIVE POWER SQUARING SHEARS
Shim stock to 1 inch capacities in
lengths from 3 - 20 feet.

NIAGARA

America's Most Complete Line of Presses,
Shears, Machines and Tools
for Plate and Sheet Metal Work

POWER PRESSES • PRESS BRAKES • POWER SQUARING SHEARS • ROTARY MACHINES • SLIP ROLL FORMERS • POWER ROTARY SHEARS • DRUM MAKING EQUIPMENT • ELECTRONIC AUTOMATIC WELDERS • GROOVERS AND SEAMERS • HAND OR FOOT OPERATED SHEARS • FOLDERS-BRAKES • LEVER SHEARS AND PUNCHES • HAND TOOLS

* MOST EXTENSIVE LINE:

From giant, power-operated machinery to small hand tools

* MOST ADVANCED DESIGNS:

Years ahead in performance through forward-thinking engineering

In the world's largest automotive and appliance plants or the smallest of sheet metal shops, Niagara machines and tools are usually at work "in force."

Batteries of giant presses are teamed up with speedy ring and circle shears. Massive, rugged press brakes stand side-by-side with powerful bending rolls and squaring shears. Versatile lever punches, rotary machines, groovers and seamers . . . all operate together to produce a better product at lower cost. The Niagara lines are "companion lines" of metalworking machines and tools that work together. A Niagara-equipped shop or plant is years ahead in quality and volume of production.

Whatever you require — power presses or hand tools — Niagara is the line that can do the most for you. It is the most complete in the industry . . . the most advanced in engineering. You can consult a Niagara representative with complete confidence of unbiased recommendations. Niagara has the right machines and tools for your requirements.

BRING YOUR FILES UP-TO-DATE WITH INFORMATIVE NIAGARA BULLETINS

A diversified and extensive list of machines and tools make up the famous Niagara line. Some of the principal types are illustrated. Be sure that you have the latest data on the ones that apply to your work. At your request, specific Bulletins will be mailed promptly.

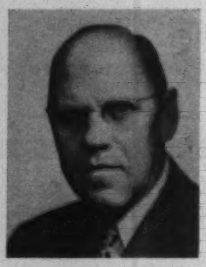
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES

Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

Service and Maintenance



C. FRED YTTERBERG
President
Kalman Floor Co. Inc.
New York

C. H. HEMPEL
President
Heresite & Chemical Co.
Manitowoc, Wis.

D. W. MILESTONE
General Sales Manager
Infra-Red Dept.
Perfection Industries, a division of
Hupp Corp., Cleveland

(*Concluded from Page* 337)

technologists are finding that properties of the filler or pigment influence coating performance; and they're recommending inhibitive pigments not only for the primer, but also for the intermediate and surface coats.

Primers based on metallic zinc, zinc silicate, or strontium chromate have been developed to prepare rust contaminated surfaces when white blast cleaning is impossible. New, water base primers and coatings (emulsion and solution types) continue to appear. They include air cure, baking, and chemical cure types. They vary in hardness; some are soft and rubbery; others are hard, mar resistant films.

New flame cured coatings, based on butoxy resins and resistant to chemicals, are said to give excellent performance underground.

Urethane coatings are also gaining popularity.

Field coating will be used primarily for maintenance or repair of mill or yard applied materials.

Changes in application methods will lead to new coating problems. Many coatings applied at the mill or yard cannot be applied in the field. The same material can't be used for repairs, recoating, or joining.

Unless field applied coatings are compatible with those put on in the mill or yard, corrosion may be accelerated in the repaired areas causing premature failure.

Color for Industrial Floors Increases Worker Efficiency

C. Fred Ytterberg—Production men are taking advantage of the psychological power of color to get full production out of today's expensive and complex machinery.

The trend to colored factory floors will continue. Many companies are putting permanent color in new concrete floors. Red and green are the most popular colors.

A colored floor improves plant lighting because of increased reflectivity. And the surface is easier to clean because glossy, colored, concrete floor shows spots that have been missed.

Organic Coatings to Gain In Corrosion Protection

C. H. Hempel—In this age of dwindling metal reserves, demand will increase for corrosion prevention information and knowhow.

High performance organic coatings will be used more widely, especially where a combination of high chemical resistance and high temperature service is needed.

Today's chemical processing industries would be virtually nonexistent without modern corrosion control. The petroleum industry, the pharmaceutical industry, and the agricultural chemical industry depend on the corrosion protection offered them by the protective coating industry, especially the chemical resistant organic coatings.

Several organic coatings are being used to control corrosion, but none surpasses baked, pure phenolic coatings. Phenolics don't usually have a high degree of flexibility, but that deficiency has been overcome through recent research and development.

Our company has developed a process for coating steel, which has been cleaned by etching or sandblasting, with a pure phenol-formaldehyde baked coating. It has a thickness of 3 to 4 mils and is baked at 380° F. It is superior to previous coatings because it contains a new plasticizer. Coated test panels withstood impact tests of 60 in.-lb and bend tests of 180 degrees. In tensile tests, the test bar was pulled beyond the yield point of the metal.

Infrared Radiant Gas Burners To Cut Heating Costs in 1960

D. W. Milestone—Rising material and labor costs will cause metalworking managers to look for more economical heating, processing, and corrosion prevention methods in 1960. And labor is demanding more comfortable working conditions in foundries, loading docks, repair shops, and other areas that weren't heated previously.

Development of a gas fired, infrared burner will make more efficient and economical industrial heating available. The unit consists of a ceramic mat (or radiant source) and a cast iron primary atmospheric burner. Temperature of 1600° F is maintained on the mat. The unit converts almost 100 per cent of the Btu input into usable heat. (Sixty per cent is radiant energy, and the rest is convected heat.)

Heat rays from the burner, like sun rays, heat only the objects they strike. In an infrared heated building, people are warmed by radiation from the unit and by radiation, conduction, and convection from the floor, walls, and machinery.

The unit puts heat where it's needed and reduces fuel costs 30 per cent. Electric power cost for heater operation is reduced 97 per cent.

Maintenance is minimized because the unit has only one moving part—a solenoid valve.

Infrared units can provide spot heat in warehouses, loading docks and exposed areas, increasing working efficiency and personnel comfort.

Condensation of water on steel can be prevented with radiant heating. It isn't economical to keep steel above the dew point of surrounding air with warm air heaters because the air rises to the top of the builidng before warming the steel.

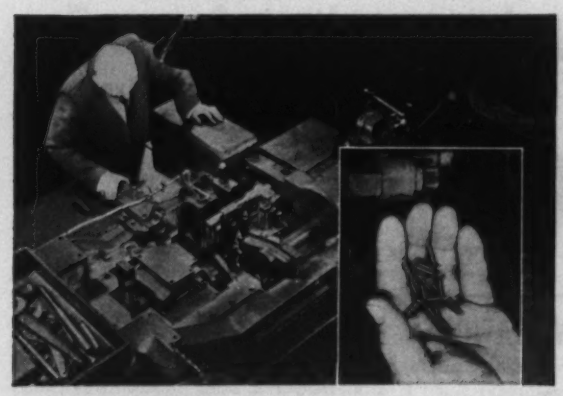
Gas infrared heat can easily be focused on the desired areas, and almost all the heat is absorbed and retained by the

Which picture do you fit?

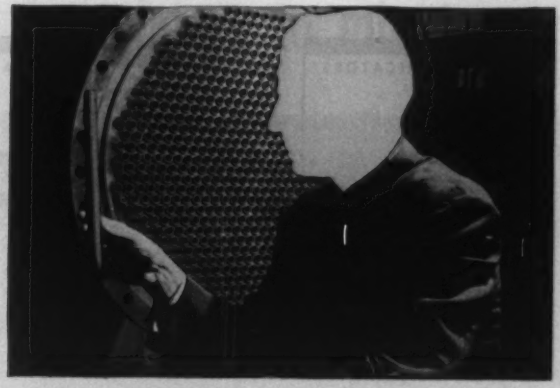
Here are four *actual* customers* with different, but exacting product and technical needs. One uses Bridgeport rod in a range of alloys, the second Bridgeport strip. A third makes fasteners from Bridgeport Brass wire. The fourth company uses Bridgeport condenser tubes *and* Technical Service to produce quality heat exchangers. Which picture do you fit with your raw materials and manufacturing requirements?

"AUTOMATIC QUALITY," says Customer A. "We've a high-volume, automatic screw machine operation. Our alloy needs vary from job to job. Our production schedules demand *consistent* quality alloy and accurate gauge. With every rod alloy we get from Bridgeport, we get what we order . . . including aluminum alloys!"

"LONG-LENGTH COILS. They're one reason why we can depend on Bridgeport for strip," says Customer B. "Superior surface finish from Bridgeport saves us production costs. With their Sendzimir mill finish and exact gauge and width in long-length coil, you can see the reasons why we depend on Bridgeport for brass, copper and aluminum strip."



"CONSISTENT GAUGE. We need Bridgeport quality brass wire to make thousands and thousands of fasteners of every description," says Customer C. "High-speed, volume cold-heading production is only as good as the alloy wire that's used. Bridgeport Brass wire is made to exact tolerances for cold-heading at high speeds—we depend on it."



"PRODUCT PLUS SERVICE," says Customer D. "We manufacture heat exchangers for many applications. Our requirements include good technical and engineering service as well as a wide choice of brass, copper and aluminum tube alloys. All of these are available from Bridgeport."

*Names on request

These examples typify national metalworking opinions. There's no mystery why manufacturers the country over depend on Bridgeport—Bridgeport products and service are *close at hand.* The many brass, copper and aluminum alloys made by Bridgeport in rod, tube, wire and strip are *readily* available from stocks in your area; Bridgeport warehouses are located to make it easy for you to get what you want on time. Volume needs are mill-delivered. Your call to your nearest Bridgeport Sales Office, or a letter to Dept. 3901 will get you engineering and technical service. Try it, and you'll agree —you do fit into the picture!

Bridgeport Brass Co.

BRIDGEPORT BRASS COMPANY

Bridgeport 2, Conn. • Sales Offices in Principal Cities

Specialists in Metals from Aluminum to Zirconium

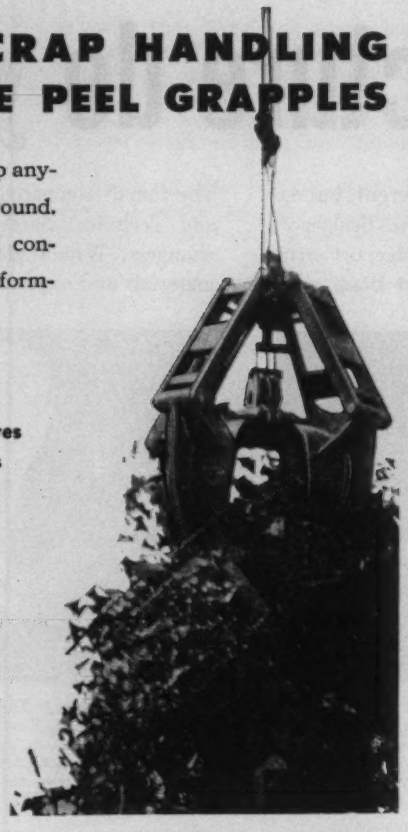
LOW-COST SCRAP HANDLING
ERIE ORANGE PEEL GRAPPLES

Strong closing action. Picks up anything it can get its blades around. All-welded high-carbon steel construction means low-cost performance for a long time.

OTHER IMPORTANT FEATURES:

- **Multi-Sheave Reeving**
- **High Wear-Resistant Alloy Sheaves**
- **Recessed Alemite Grease Fittings**
- **3 and 4-Blade Models**
- **¼ to 4 cu. yds.**

Write for Free Booklet



ERIE STRAYER COMPANY

1410 RUDOLPH AVE., ERIE, PA.

Service and Maintenance

E. A. CARSEY
Assistant Chief Engineer
Kirk & Blum Mfg. Co.
Cincinnati

steel. The floor serves as a radiant surface, heating the lower sheets of steel; infrared heat strikes the top of stacked material and is conducted through it.

The burners will be used in processing equipment that takes less floor space, costs less to operate, and does more work than equipment we now use.

Technology Changes Expected In Dust and Fume Control

E. A. Carsey—Technological advances, especially in collecting equipment, will play a major role in establishing trends in dust and fume control.

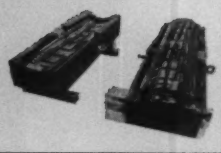
If the collector, or cleaning device, isn't properly engineered and applied, the entire dust and fume control system is of questionable value. Collector efficiency (ratio of collected contaminants to those allowed to escape) is being studied more closely by municipalities.

Some eastern states require filing of plans and engineering data before installation of collection equipment. Installations are inspected when they are completed.

The federal government is sponsoring a study of collector efficiencies at Robert A. Taft Engineering Center, Cincinnati. Air pollution control and hygiene associations, as well as professional groups, are active in the field of dust and fume control.

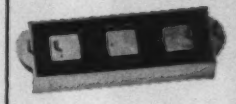
Materials used in the control systems: Galvanized or black iron and steel, in gages from #24 through ½ in. Nonferrous metals are sometimes used in lighter gages. Protective coatings are gaining popularity. They include several types of polyvinyl resins.

TOOL FABRICATORS



CASTING
MASS-CASTING
LAMINATING
SPLINING
CORE FABRICATING
VACUUM BAGGING
GEL COATING

PATTERN MAKING

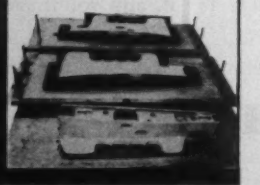


SPECIALISTS IN **PLASTICS TOOLING FORMULATIONS**

EPOCAST®
QUALITY CONTROLLED FORMULATIONS

furane plastics INCORPORATED — 4516 BRAZIL STREET • LOS ANGELES 39, CALIF.

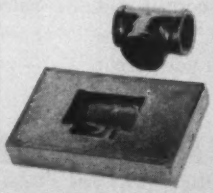
FOUNDRIES

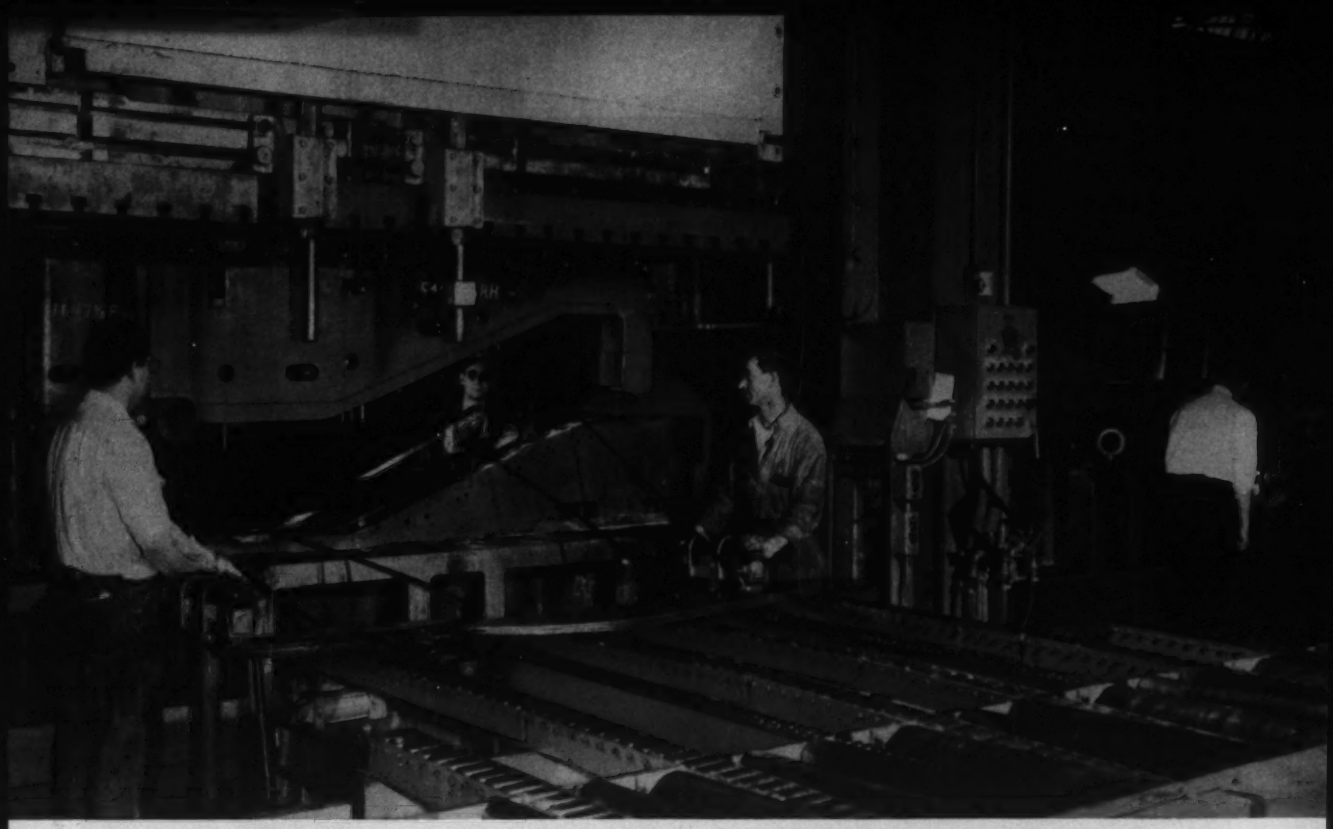


Registered trade names:

- EPOCAST
- EPIBOND
- PLASPREG
- CALCERITE
- JET-KOTE
- EPOFILM

MACHINISTS





New design permits tooling up of one bolster *(right)* while press is producing parts from die on other bolster. This press, at the A. O. Smith Corp. plant, in Milwaukee, Wis., is expected to achieve 94% utilization.

Press downtime . . . down from hours to minutes

THE NEW HAMILTON SLIDING BOLSTER PRESS:

- **Reduces parts inventory**
- **Meets changing schedules on time**
- **Cuts number of presses required where die changing is frequent**
- **Eliminates long and costly die setting operations**
- **Provides storage area within press frame**
- **Available in all types and tonnages**

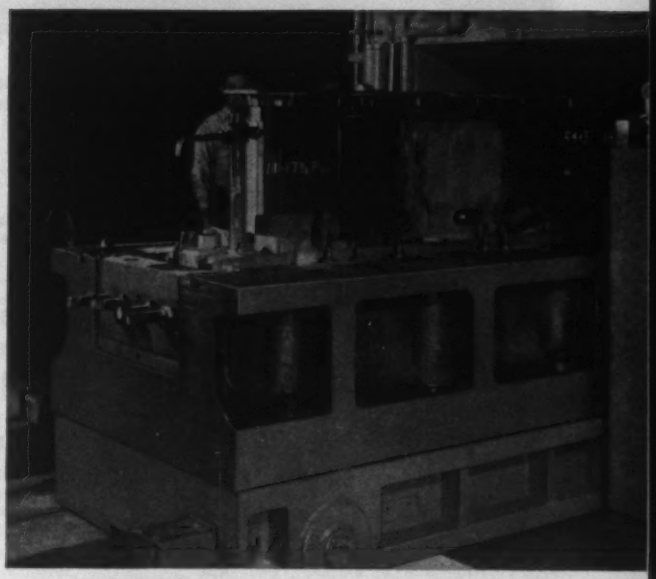
No longer need hours – and sometimes days – be wasted in unproductive press downtime while changing dies for another run. This major step in stamping and forming press room operations is made possible with the Hamilton Sliding Bolster press.

A 1250-ton 2-point, top-drive press equipped with two sliding bolsters recently installed at a Midwest automobile parts plant is proving the economies of the innovation—on parts up to 12 ft. long.

While the press produces parts from a die mounted on its operating bolster, a second bolster can be tooled for the next run. Changeover time is negligible —pushbutton-controlled hydraulic motors quickly and positively position the second bolster for speedy startup and production of the next part.

In the open position, the bolster is clear of the press frame for easy die change and setup. Crane handling of heavy dies is absolutely unobstructed.

For further information, write Dept. 1-A



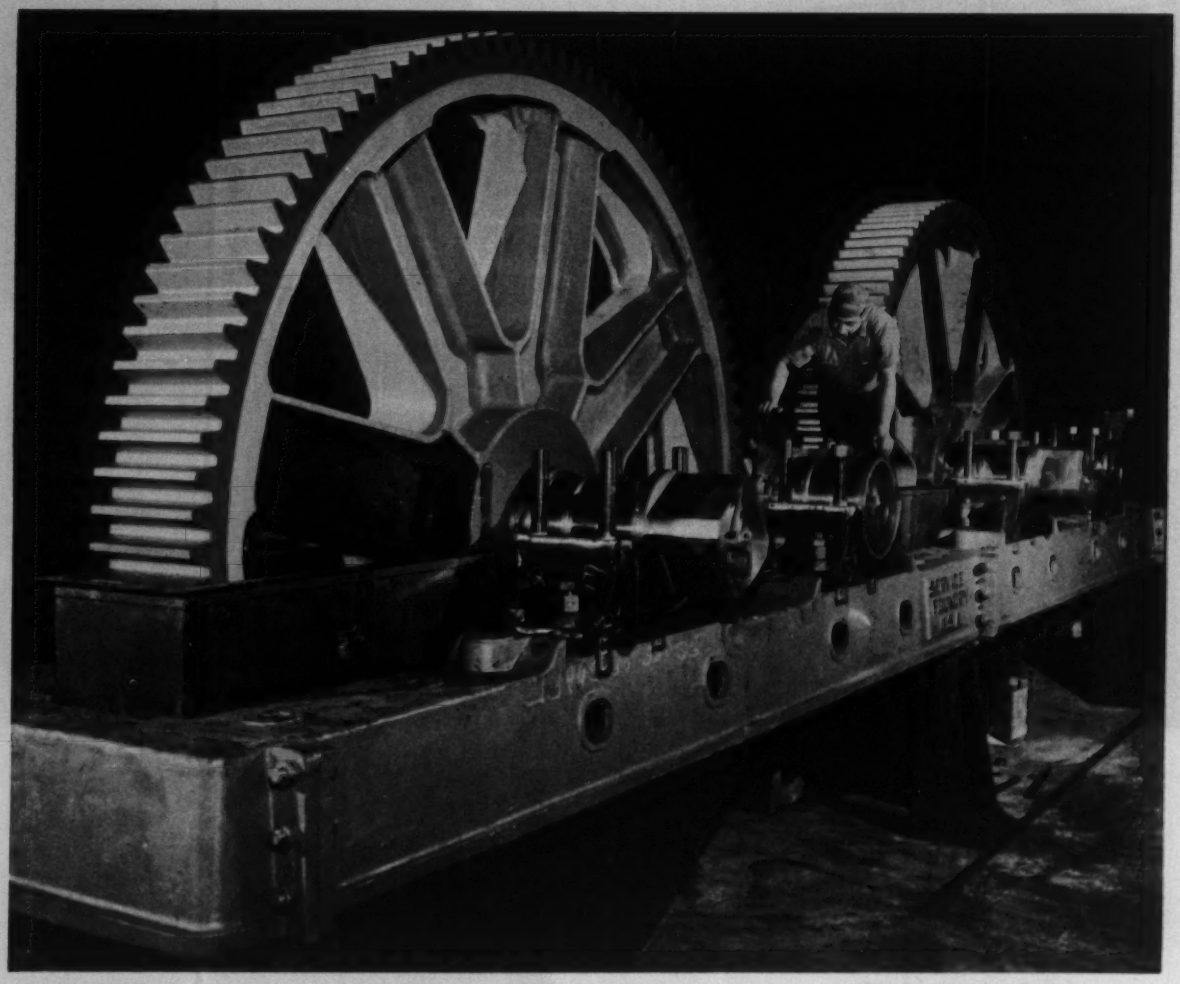
Pushbutton-operated bolsters slide into place in minutes. Downtime for changing dies is virtually eliminated.

BALDWIN · LIMA · HAMILTON

Hamilton Division, Hamilton, Ohio

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools & general machinery

BALDWIN BLH LIMA-HAMILTON



large cast steel gears by

SERVICE FOUNDRY

Service Foundry Division of Avondale manufactures cast steel gears (plain or alloyed) up to 16'-1½" outside diameter and 30" face. Teeth are cut without limitation as to tooth form or size on a Gleason gear planer. Cast tooth gears are also manufactured. For large cast steel gears to your designs and specifications—contact Service Foundry.

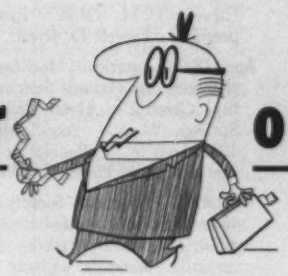
VERSATILE BUILDER ON THE MISSISSIPPI

AVONDALE MARINE WAYS, INC.

Service Foundry DIVISION

416 ERATO ST. • JAckson 2-3836 • NEW ORLEANS 13, U. S. A.

1960 Calendar of Meetings



JANUARY

Jan. 10-13, Institute of Scrap Iron & Steel Inc.: Annual meeting and exhibit, Fontainebleau Hotel, Miami Beach, Fla. Institute's address: 1729 H St. N.W., Washington 6, D. C. Executive vice president: Edwin C. Barringer.

Jan. 11-15, Society of Automotive Engineers Inc.: Annual meeting and engineering display, Sheraton-Cadillac and Statler-Hilton Hotels, Detroit. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Jan. 15, Malleable Founders' Society: Semiannual meeting, Hotel Sheraton-Cleveland, Cleveland. Society's address: 781 Union Commerce Bldg., Cleveland 14, Ohio. Executive vice president: Lowell D. Ryan.

Jan. 18-19, Industrial Heating Equipment Association: Annual meeting, Warwick Hotel, Philadelphia. Association's address: Associations Bldg., Washington 6, D. C. Executive vice president: Robert E. Fleming.

Jan. 18-21, American Road Builders Association: Annual convention and highway materials and services exhibit, Netherland-Hilton Hotel, Cincinnati. Association's address: 600 World Center Bldg., Washington 6, D. C. Executive vice president: L. W. Prentiss.

Jan. 19-20, Steel Shipping Containers Institute Inc.: Winter meeting, St. Regis Hotel, New York. Institute's address: 600 Fifth Ave., New York 20, N. Y. Secretary: L. B. Miller.

Jan. 20-22, American Management Association: Research and development conference, Roosevelt Hotel, New York. Association's address: 1515 Broadway, New York 36, N. Y.

Jan. 20-22, Steel Plate Fabricators Association: Annual meeting, Roosevelt Hotel, New Orleans. Association's address: 105 W. Madison St., Chicago 2, Ill. Secretary: J. Dwight Evans.

Jan. 21-22, National Industrial Conference Board Inc.: General session for all associates, Hotel Commodore, New York. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

Jan. 24-27, Truck-Trailer Manufacturers Association: Annual convention, Del Coronado Hotel, Coronado, Calif. Association's address: 710 Albee Bldg., Washington 5, D. C. Managing director: John B. Hulse.

Jan. 24-28, Associated Equipment Distributors: Annual meeting and exhibit, Conrad Hilton Hotel, Chicago. Association's address: 30 E. Cedar St., Chicago 11, Ill. Executive secretary: P. D. Herman.

Jan. 25-28, Plant Maintenance & Engineering Conference and Show: Convention Hall, Philadelphia. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

Jan. 28, Cutting Tool Manufacturers Association: Annual meeting, Harmonie Club, Detroit. Association's address: 1216 Penobscot Bldg., Detroit 26, Mich. Executive secretary: Martin J. Ewald.

Jan. 30-Feb. 6, Association of Steel Distributors Inc.: Annual convention, El Mirador Hotel, Palm Springs, Calif. Association's addess: 29 Broadway, New York 6, N. Y. Counsel: Morris Rosoff.

FEBRUARY

Feb. 1-4, Instrument Society of America: Instrument-automation conference and exhibit, Rice Hotel and Sam Houston Coliseum, Houston. Society's address: 313 Sixth Ave., Pittsburgh 22, Pa. Executive director: William H. Kushnick.

Feb. 1-5, American Society for Testing Materials: Committee Week, Sherman Hotel, Chicago. Society's address: 1916 Race St., Philadelphia 3, Pa. Executive secretary: Robert J. Painter.

Feb. 2-4, Society of the Plastics Industry Inc.: Reinforced Plastics Division conference, Edgewater Beach Hotel, Chicago. Society's address: 250 Park Ave., New York 17, N. Y. Executive vice president: William T. Cruse.

Feb. 4-5, Alloy Casting Institute: Winter meeting, Key Biscayne Hotel, Key Biscayne, Fla. Institute's address: 286 Old Country Rd., Mineola, N. Y. Executive vice president: E. A. Schoefer.

Feb. 14-18, American Institute of Mining, Metallurgical & Petroleum Engineers Inc.: Annual meeting, Sheraton-Atlantic and Statler-Hilton Hotels, New York. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

Feb. 15-17, American Management Association: Midwinter personnel conference, Palmer House, Chicago. Association's address: 1515 Broadway, New York 36, N. Y.

Feb. 17-18, Malleable Founders' Society: Technical and operating conference, Wade Park Manor, Cleveland. Society's address: 781 Union Commerce Bldg., Cleveland 14, Ohio. Executive vice president: Lowell D. Ryan.

Feb. 16-18, Caster & Floor Truck Manufacturers Association: Annual meeting, St. Moritz Hotel, New York. Association's address: 27 E. Monroe St., Chicago 3, Ill. Executive secretary: Harry P. Dolan.

Feb. 24-26, American Management Association: Marketing conference, Roosevelt Hotel, New York. Association's address: 1515 Broadway, New York 36, N. Y

Feb. 24-27, National Tool & Die Manufacturers Association: Winter meeting, Roosevelt Hotel, New Orleans. Association's address: 907 Public Square Bldg., Cleveland 13, Ohio. Executive vice president: George S. Eaton.

MARCH

Mar. 7-8, Steel Founders' Society of America: Annual meeting, Drake Hotel, Chicago. Society's address: 606 Terminal Tower, Cleveland 13, Ohio. Executive vice president: F. Kermit Donaldson.

Mar. 13-15, National Association of Waste Material Dealers: Annual meeting, Waldorf-Astoria Hotel, New York. Association's address: 271 Madison Ave., New York 16, N. Y. Administrator: M. J. Mighdoll.

Mar. 14-18, National Association of Corrosion Engineers: National conference and corrosion show, Memorial Auditorium, Dallas. Association's address: 1061 M & M Bldg., Houston 2, Tex. Executive secretary: T. J. Hull.

Mar. 15-17, Society of Automotive Engineers Inc.: National automobile meeting, Sheraton-Cadillac Hotel, Detroit. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Mar. 17, National Industrial Conference Board Inc.: General session for all as-

sociates, Somerset Hotel, Boston. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

Mar. 22-24, Society of Automotive Engineers Inc.: National production meeting, Statler-Hilton Hotel, Cleveland. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Mar. 23-25, Pressed Metal Institute: Spring technical meeting, Carter Hotel, Cleveland. Institute's address: 3673 Lee Rd., Cleveland 20, Ohio. Managing director: Harold A. Daschner.

Mar. 27-31, Scientific Apparatus Makers Association: Annual meeting, Boca Raton Hotel & Club, Boca Raton, Fla. Association's address: 20 N. Wacker Dr., Chicago 6, Ill. Executive vice president: Kenneth Andersen.

Mar. 29, Material Handling Institute Inc.: Spring meeting, Pittsburgh-Hilton Hotel, Pittsburgh. Information: Hanson & Shea Inc., 1 Gateway Center, Pittsburgh 22, Pa.

APRIL

Apr. 3-6, National Screw Machine Products Association: Annual meeting, Ambassador Hotel, Los Angeles. Association's address: 2860 E. 130th St., Cleveland 20, Ohio. Executive vice president: Orrin B. Werntz.

Apr. 3-8, Nuclear Congress and Atomic Exposition: Coliseum, New York. Coordinator: Engineers Joint Council, 29 W. 39th St., New York 18, N. Y. Secretary: E. Paul Lange.

Apr. 4-6, Metallurgical Society of AIME: Annual national open hearth steel conference and blast furnace, coke oven, and raw materials conference, Palmer House, Chicago. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: R. W. Shearman.

Apr. 4-7, American Management Association: Packaging show and conference, Convention Hall and Shelburne Hotel, Atlantic City, N. J. Association's address: 1515 Broadway, New York 36, N. Y.

Apr. 5-8, Society of Automotive Engineers Inc.: National aeronautic meeting, production forum, and engineering display, Hotel Commodore, New York. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Apr. 6-8, American Zinc Institute Inc. and Lead Industries Association: Joint conference and annual meetings, Chase-Park Plaza Hotel, St. Louis. Information: LIA or AZI, 60 E. 42nd St., New York 17, N. Y.

Apr. 12-14, Steel Shipping Containers Institute Inc.: Annual meeting, Breakers Hotel, Palm Beach, Fla. Institute's address: 600 Fifth Ave., New York 20, N. Y. Secretary: L. B. Miller.

Apr. 13-14, Malleable Founders' Society: Market development conference, Edgewater Beach Hotel, Chicago. Society's address: 781 Union Commerce Bldg., Cleveland 14, Ohio. Executive vice president: Lowell D. Ryan.

Apr. 18-20, American Machine Tool Distributors Association: Semiannual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va. Association's address: 1900 Arch St., Philadelphia 3, Pa. General manager: James C. Kelley.

Apr. 19-21, American Society of Lubrication Engineers: Annual meeting and exhibit, Netherland-Hilton Hotel, Cincinnati. Society's address: 5 N. Wabash Ave., Chicago 2, Ill. Executive secretary: Calvert L. Willey.

Apr. 20-22, National Association of Sheet Metal Distributors: Spring meeting, Deshler-Hilton Hotel, Columbus, Ohio. Association's address: 1900 Arch St., Philadelphia 3, Pa. Executive secretary: Thomas A. Fernley Jr.

Apr. 21-22, American Institute of Mining, Metallurgical & Petroleum Engineers: Southwest metals and minerals conference, Ambassador Hotel, Los Angeles. Conference headquarters: Room 1234, 523 W. Sixth St., Los Angeles 14, Calif.

Apr. 21-28, American Society of Tool Engineers: Tool show and annual meeting, Statler-Hilton and Sheraton-Cadillac Hotels, Detroit. Society's address: 10700 Puritan Ave., Detroit. Executive secretary: Harry E. Conrad.

Apr. 24-27, Metal Powder Industries Federation: Annual meeting and powder metallurgy show, Drake Hotel, Chicago. Federation's address: 60 E. 42nd St., New York 17, N. Y. Executive secretary & treasurer: Kempton H. Roll.

Apr. 25-29, American Welding Society: Annual meeting and welding exhibition, Biltmore Hotel and Great Western Exhibit Center, Los Angeles. Society's address: 33 W. 39th St., New York 18, N. Y. National secretary: Fred L. Plummer.

Apr. 26-29, Copper & Brass Research Association: Annual meeting, Emerald Beach Hotel, Nassau, Bahamas. Association address: 1900 Arch St., Philadelphia 3, Pa. Executive secretary: Thomas A. Fernley Jr.

MAY

May 1-4, Chamber of Commerce of the U. S.: Annual meeting, Constitution Hall, Washington. Chamber's address: 1615 H St. N.W., Washington 6, D. C. Executive vice president: Arch N. Booth.

May 1-5, Electrochemical Society Inc.: Annual meeting, LaSalle Hotel, Chicago. Society's address: 1860 Broadway, New York 23, N. Y. Executive secretary: Robert K. Shannon.

May 5-6, American Institute of Steel Construction: National engineering conference, Brown-Palace Hotel, Denver. Institute's address: 101 Park Ave., New York 17, N. Y. Executive vice president: L. Abbett Post.

May 7-10, National Tool & Die Manufacturers Association: Spring meeting, Statler-Hilton Hotel, Washington. Association's address: 907 Public Square Bldg., Cleveland 13, Ohio. Executive vice president: George S. Eaton.

May 9-12, Instrument Society of America: Instrument-automation conference and exhibit, Civic Auditorium and Brooks Hall, San Francisco. Society's address: 313 Sixth Ave., Pittsburgh 22, Pa. Executive director: William H. Kushnick.

May 9-12, Society for Nondestructive Testing: Semiannual meeting, Baker Hotel, Dallas. Society's address: 1109 Hinman Ave., Evanston, Ill. Secretary: Philip D. Johnson.

May 9-13, American Foundrymen's Society: Castings congress and exposition, Convention Hall, Philadelphia. Society's address: Golf and Wolf Roads, Des Plaines, Ill. General manager: W. W. Maloney.

May 9-13, American Society for Metals: Southwestern Metal Congress and Exposition, State Fair Park, Dallas. Society's address: Metals Park, Novelty, Ohio. Managing director: Allan Ray Putnam.

May 11-14, Machinery Dealers National Association: Annual meeting, Edgewater Beach Hotel, Chicago. Association's address: 1346 Connecticut Ave. N.W., Washington 6, D. C. Executive director: R. K. Vinson.

May 15-18, Steel Service Center Institute: Annual meeting, Fontainebleau Hotel, Miami Beach, Fla. Institute's address: 540 Terminal Tower, Cleveland 13, Ohio. Executive vice president and secretary: Robert G. Welch.

May 17-19, American Society of Mechanical Engineering: Production engineering conference, Schroeder Hotel, Milwauke. Society's address. 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

May 18-20, American Management Association: General management conference, Roosevelt Hotel, New York. Association's address: 1515 Broadway, New York 36, N. Y.

May 18-20, Electronic Industries Association: Annual meeting, Pick-Congress Hotel, Chicago. Association's address: 1721 DeSales St. N.W., Washington 6, D. C. Secretary: James D. Secrest.

May 19-20, National Industrial Conference Board Inc.: General session for all associates on economics and annual meeting of board members, Waldorf-Astoria Hotel, New York. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

May 22-25, Industrial Heating Equipment Association: Spring meeting, Homestead Hotel, Hot Springs, Va. Association's address: Associations Bldg., Washington 6, D. C. Executive vice president: Robert E. Fleming.

May 22-25, National Association of Purchasing Agents: Annual meeting and exhibit, Biltmore Hotel, Los Angeles. Association's address: 11 Park Place, New York 7, N. Y. Executive secretary: G. W. H. Ahl.

May 23-25, Triple Industrial Supply Convention: Conrad Hilton Hotel, Chicago. Information: W. B. Thomas, Thomas

Associates, Keith Bldg., Cleveland 15, Ohio.

May 23-26, Design Engineering Show & Conference: Coliseum, New York. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

May 24-26, American Society for Quality Control: Annual meeting and exhibit, Sheraton-Palace Hotel, San Francisco. Society's address: 161 W. Wisconsin Ave., Milwaukee 3, Wis. Administrative secretary: W. P. Youngclaus Jr.

May 25-26, American Iron & Steel Institute: Annual membership meeting, Waldorf-Astoria Hotel, New York. Institute's address: 150 E. 42nd St., New York 17, N. Y. Secretary: George S. Rose.

JUNE

June 5-9, Association of Industrial Advertisers: Annual meeting and exhibit, Shoreham Hotel, Washington. Association's address: 271 Madison Ave., New York 16, N. Y. President: John C. Freeman.

June 5-10, American Society of Mechanical Engineers: Semiannual meeting and aviation conference, Statler-Hilton Hotel, Dallas. Society's address: 20 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

June 5-10, Society of Automotive Engineers Inc.: Summer meeting, Edgewater Beach Hotel, Chicago. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

June 6-8, Malleable Founders' Society: Annual meeting, Elbow Beach Surf Club, Hamilton, Bermuda. Society's address: 781 Union Commerce Bldg., Cleveland 14, Ohio. Executive vice president: Lowell D. Ryan.

June 6-8, American Gear Manufacturers Association: Annual meeting, Homestead Hotel, Hot Springs, Va. Association's address: 1 Thomas Circle, Washington 5, D. C. Executive director: John C. Sears.

June 13-15, Metal Powder Industries Federation and Metallurgical Society of AIME: International conference on powder metallurgy, Biltmore Hotel, New York. Federation's address: 60 E. 42nd St., New York 17, N. Y. Executive secretary and treasurer: Kempton H. Roll.

June 15-17, American Marketing Association: Annual meeting and exhibit, Leamington Hotel, Minneapolis. Association's address: 27 E. Monroe St., Chicago 3, Ill. Executive director: Vance E. Lockhart.

June 19-21, Alloy Casting Institute: Annual meeting, Homestead Hotel, Hot Springs, Va. Institute's address: 286 Old Country Rd., Mineola, N. Y. Executive vice president: E. A. Schoefer.

June 26-29, Drop Forging Association: Annual meeting, Seignory Club, Papineau County, Quebec. Association's address: 55 Public Square, Cleveland 13, Ohio. Executive vice president: Dwight M. Allgood.

June 26-July 1, American Society for Testing Materials: Annual meeting and exhibit, Chalfonte-Haddon Hall Hotel, Atlantic City, N J. Society's address: 1916 Race St., Philadelphia 3, Pa. Executive secretary: Robert J. Painter.

JULY-AUGUST

July 2-6, National Tool & Die Manufacturers Association: Summer meeting, Banff Springs Hotel, Banff, Alta. Association's address: 907 Public Square Bldg, Cleveland 13, Ohio. Executive vice president: George S. Eaton.

July 10-13, Truck-Trailer Manufacturers Association: Summer meeting, Homestead Hotel, Hot Springs, Va. Association's address: 710 Albee Bldg., Washington 5, D. C. Managing director: John B. Hulse.

July 22-24, National Association of Metal Finishers: Annual meeting, Statler-Hilton Hotel, Los Angeles. Association's address: 60 Bently Rd., Cedar Grove, N. J. Executive secretary: P. Peter Kovatis.

July 24-28, American Electroplaters Society: Annual meeting, Statler-Hilton Hotel, Los Angeles. Society's address: 445 Broad St., Newark 2, N. J. Executive secretary: John P. Nichols.

Aug. 15-17, American Society of Mechanical Engineers and American Institute of Chemical Engineers: Heat transfer conference and exhibit, Statler-Hilton Hotel, Buffalo. Information: ASME, 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

Aug. 16-19, Society of Automotive Engineers Inc.: National West Coast meeting, Jack Tar Hotel, San Francisco. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

SEPTEMBER

Sept. 3-4, American Machine Tool Distributors Association: Annual meeting, LaSalle Hotel, Chicago. Association's address: 1900 Arch St., Philadelphia 3, Pa. General manager: James C. Kelley.

Sept. 6-16, National Machine Tool Builders' Association: Machine Tool Exposition, International Amphitheatre, Chicago. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

Sept. 6-16, Production Engineering Show: Navy Pier, Chicago. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

Sept. 7-15, Coliseum Machinery Show: Coliseum, Chicago. Information: A. Byron Perkins & Associates, 2807 Sunset Blvd, Los Angeles 26, Calif.

Sept. 12-13, Material Handling Institute Inc.: Fall meeting, Cavalier Club, Virginia Beach, Va. Information: Hanson & Shea Inc., 1 Gateway Center, Pittsburgh 22, Pa.

Sept. 12-15, Society of Automotive Engineers Inc.: National farm, construction, and industrial machinery meeting, production forum, and engineering display, Milwaukee Auditorium, Milwaukee. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Sept. 13-16, Electronic Industries Association: Fall meeting, French Lick-Sheraton Hotel, French Lick, Ind. Association's address: 1721 DeSales St. N.W., Washington 6, D. C. Secretary: James D. Secrest.

Sept. 14-15, American Die Casting Institute: Annual meeting, Edgewater Beach Hotel, Chicago. Institute's address: 366 Madison Ave., New York 17, N. Y. Secretary: David Laine.

Sept. 14-16, National Industrial Conference Board Inc.: General session for all associates on marketing, Waldorf-Astoria Hotel, New York. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

Sept. 18-21, Packaging Machinery Manufacturers Institute: Annual meeting, Otsego Ski Club, Gaylord, Mich. Institute's address: 60 E. 42nd St., New York 17, N. Y. Executive director: Russell L. Sears.

Sept. 19-20, Steel Founders' Society of America: Fall meeting, Homestead Hotel, Hot Springs, Va. Society's address: 606 Terminal Tower, Cleveland 13, Ohio. Executive vice president: F. Kermit Donaldson.

Sept. 21-23, American Society of Mechanical Engineers and American Institute of Electrical Engineers: Power conference, Bellevue-Stratford Hotel, Philadelphia. Information: ASME, 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

Sept. 22-23, National Foundry Association: Annual meeting, Edgewater Beach Hotel, Chicago. Association's address: 53 W. Jackson Blvd., Chicago 4, Ill. Executive secretary: C. T. Sheehan.

Sept. 26-30, American Welding Society Inc.: National fall meeting, Pittsburgh. Society's address: 33 W. 39th St., New York 18, N. Y. National secretary: Fred L. Plummer.

Sept. 26-30, Instrument Society of America: Instrument-automation conference and exhibit and annual meeting, Coliseum, New York. Society's address: 313 Sixth Ave., Pittsburgh 22, Pa. Executive director: William H. Kushnick.

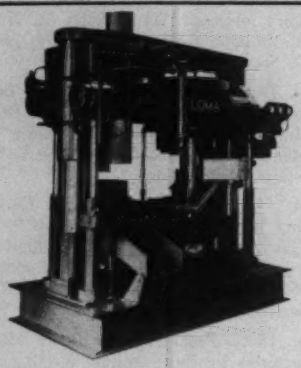
Sept. 27-30, Association of Iron & Steel Engineers: Annual meeting and exposition, Public Auditorium, Cleveland. Association's address: 1010 Empire Bldg., Pittsburgh 22, Pa. Managing director: T. J. Ess.

OCTOBER

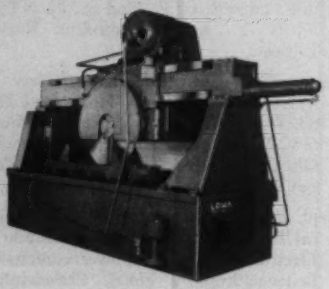
Oct. 10-11, American Society of Mechanical Engineers and American Institute of Electrical Engineers: Fuels conference, Daniel Boone Hotel, Charleston, W. Va. Information: ASME, 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

Oct. 10-14, Pressed Metal Institute: Annual meeting, Shawnee Inn, Shawnee on Delaware, Pa. Institute's address: 3673

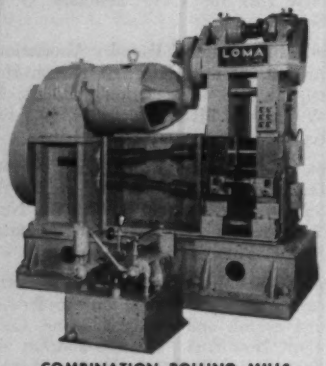
LOMA
MAKES THEM ALL



CONTINUOUS CASTING MACHINES



CIRCULAR SAWING MACHINES



COMBINATION ROLLING MILLS

Our standard line of equipment includes:

- Casting Machines and Molds
- Saws and Cut-off Machinery
- Hot and Cold Rolling Mills
- Rod and Tube Draw Benches
- Roller and Stretcher Levellers
- Air and Hydraulic Tube Testers

LOMA
MACHINE MFG. CO., INC.
114 East 32nd Street
New York 16, N. Y.

Lee Rd., Cleveland 20, Ohio. Managing director: Harold A. Daschner.

Oct. 10-14, Society of Automotive Engineers Inc.: National aeronautic meeting, manufacturing forum, and engineering display, Ambassador Hotel, Los Angeles. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Oct. 12-14, Gray Iron Founders' Society Inc.: Annual meeting, Netherland-Hilton Hotel, Cincinnati. Society's address: 930 National City-E. 6th Bldg., Cleveland 14, Ohio. Executive vice president: Donald H. Workman.

Oct. 13-15, Nonferrous Founders' Society: Annual meeting, Grove Park Inn, Asheville, N. C. Society's address: 1604 Chicago Ave., Evanston, Ill. Executive secretary: Herbert Scobie.

Oct. 17-18, Magnesium Association: Anual convention, Pick-Carter Hotel, Cleveland. Association's address: 122 E. 42nd St., New York 17, N. Y. Executive secretary: Jerry Singleton.

Oct. 17-19, American Society of Lubrication Engineers and American Society of Mechanical Engineers: Joint lubrication conference, Statler-Hilton Hotel, Boston. ASLE's address: 5 N. Wabash Ave., Chicago 2, Ill. Executive secretary: Calvert L. Willey.

Oct. 17-21, Metallurgical Society of AIME: Annual fall meeting, Sheraton Hotel, Philadelphia. Society's address: 29. W. 39th St., New York 18, N. Y. Secretary: R. W. Shearman.

Oct. 17-21, National Metal Exposition & Congress: Trade and Convention Center, Philadelphia. Sponsor: American Society for Metals, Metals Park, Novelty, Ohio. Managing director: Allan Ray Putnam.

Oct. 17-21, Society for Nondestructive Testing: Annual meeting, Philadelphia. Society's address: 1109 Hinman Ave, Evanston, Ill. Secretary: Philip D. Johnson.

Oct. 19-23, National Tool & Die Manufacturers Association: Annual meeting, Leamington Hotel, Minneapolis. Association's address: 907 Public Square Bldg., Cleveland 13, Ohio. Executive vice president: George S. Eaton.

Oct. 24-25, American Hot Dip Galvanizers Association: Semiannual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va. Association's address: 1806 First National Bank Bldg., Pittsburgh 22, Pa. Secretary: Stuart J. Swensson.

Oct. 24-26, American Gear Manufacturers Association: Semiannual meeting, Edgewater Beach Hotel, Chicago. Association's address: 1 Thomas Circle, Washington 5, D. C. Executive director: John C. Sears.

Oct. 24-26, Truck Body & Equipment Association Inc.: Annual convention and exhibit, Hotel Sherman, Chicago. Association's address: 1616 K St. N.W., Washington 6, D. C. Executive manager: Arthur H. Nuesse.

Oct. 25-27, Society of Automotive Engineers Inc.: National transportation meeting, Hotel Leamington, Minneapolis. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Oct. 31-Nov. 3, American Institute of Steel Construction: Annual convention, Greenbrier Hotel, White Sulphur Springs, W. Va. Institute's address: 101 Park Ave., New York 17, N. Y. Executive vice president: L. Abbett Post.

NOVEMBER

Nov. 3-4, Society of Automotive Engineers Inc.: National fuels and lubricants meeting, Mayo Hotel, Tulsa, Okla. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Nov. 14-16, Steel Founders' Society of America: Technical and operating conference, Pick-Carter Hotel, Cleveland. Society's address: 606 Terminal Tower, Cleveland 13, Ohio. Executive vice president: F. Kermit Donaldson.

Nov. 14-17, Wire Association: Annual meeting, LaSalle Hotel, Chicago. Association's address: 453 Main St., Stamford, Conn. Executive secretary: Richard E. Brown.

Nov. 14-18, American Society of Tool Engineers: Western tool show, Memorial Sports Arena and Ambassador Hotel, Los Angeles. Society's address: 10700 Puritan Ave., Detroit 38, Mich. Executive secretary: Harry E. Conrad.

Nov. 17, National Industrial Conference Board Inc.: General session for all associates, Penn-Sheraton Hotel, Pittsburgh. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

Nov. 27-Dec. 2, American Society of Mechanical Engineers: Annual meeting, Statler-Hilton Hotel, New York. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

Nov. 30-Dec. 2, Metallurgical Society of AIME: Electric furnace conference, Morrison Hotel, Chicago. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: R. W. Shearman.

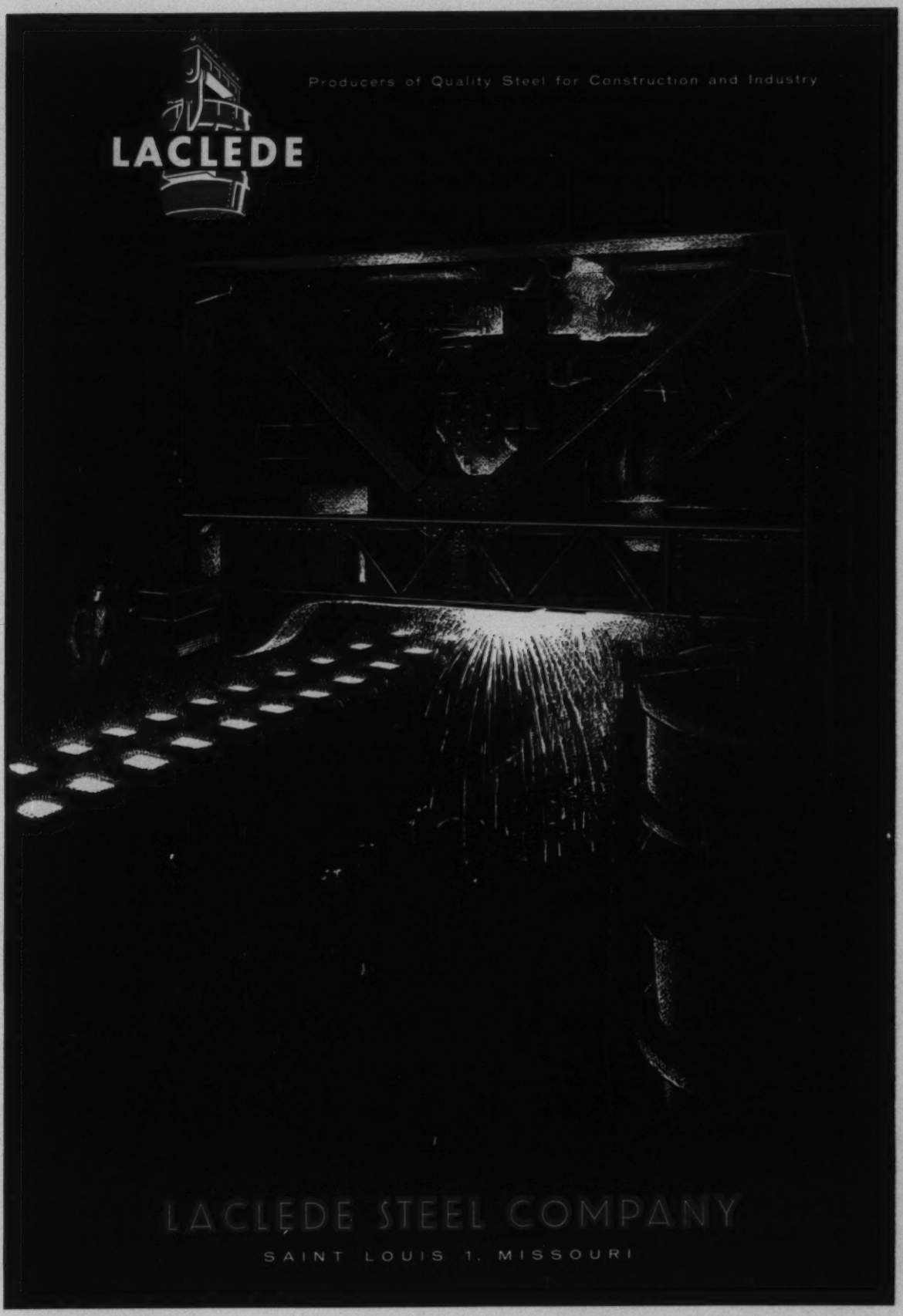
DECEMBER

Dec. 3-6, American Institute of Chemical Engineers: Annual meeting, New Yorker Hotel, New York. Institute's address: 25 W. 45th St, New York 36, N. Y. Secretary: F. J. Van Antwerpen.

Dec. 7-9, National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York. Association's address: 2 E. 48th St., New York 17, N. Y. Executive vice president: Charles R. Sligh Jr.

Dec. 12-15, Atomic Industrial Forum and American Nuclear Society: Atomic industry exhibitions and conferences, California Masonic Memorial Temple, San Francisco. Information: AIF, 3 E. 54th St., New York 22, N. Y. Executive manager: Charles Robbins.

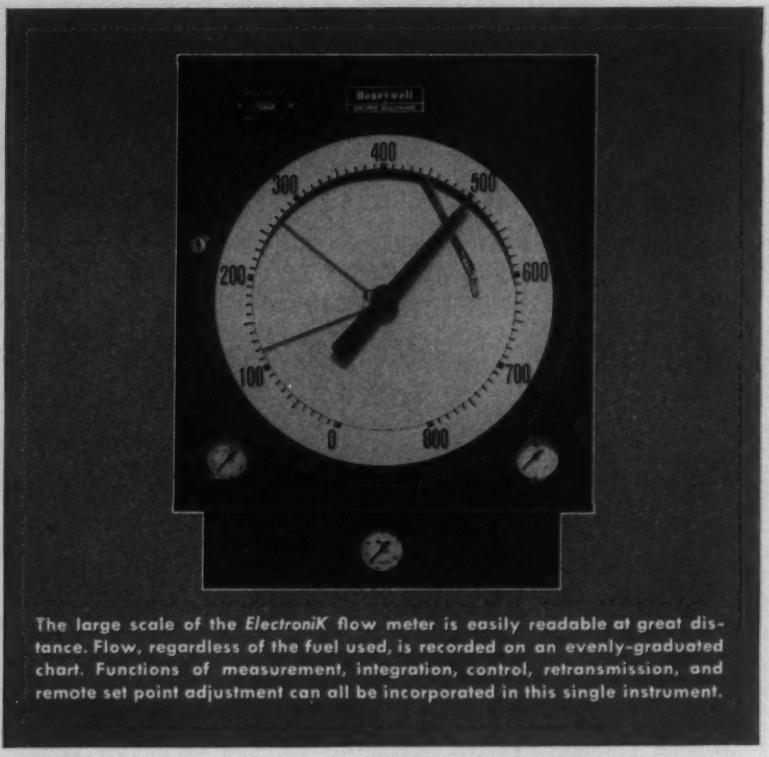
Dec. 12-15, Industrial Building Exposition & Congress: Coliseum, New York. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.


LACLEDE
Producers of Quality Steel for Construction and Industry
LACLEDE STEEL COMPANY
SAINT LOUIS 1, MISSOURI

use these accessories with the *ElectroniK* flow meter

Area type electric flow transmitter for measurement of the flow of oil, tar, pitch or other viscous fluids.

Ledoux bell type electric meter body for measuring atomizing steam flow.



The large scale of the *ElectroniK* flow meter is easily readable at great distance. Flow, regardless of the fuel used, is recorded on an evenly-graduated chart. Functions of measurement, integration, control, retransmission, and remote set point adjustment can all be incorporated in this single instrument.

ElectroniK

flow meter lets you switch fuels without upsetting fuel-air ratio

. . . records, indicates, integrates, controls and transmits

Bell type electric meter body for measurement of air or gas flow.

Honeywell diaphragm control valves for fuel, air and steam flows.

Use the highly versatile, accurate *ElectroniK* flow meter to save fuel dollars and improve operating efficiency in combined fuel systems. It's calibrated for both gas flow and equivalent oil flow, and automatically proportions the input of each type of fuel on the basis of total Btu input required at the furnace.

The *ElectroniK* flow meter operates on the induction bridge principle, for highest accuracy. For freedom from vibration effects, pen and pointer are positioned by the dependable Brown balancing motor and amplifier used in all *ElectroniK* instruments.

The meter can be supplied with an adjustable *Indexet* unit by which the set point can be established from a remote point—manually, by a pneumatic loading station, or automatically, by another instrument. *Indexet* also provides the wide span and zero adjustments needed to "tune" the instrument to the process with extreme precision.

Other options, such as a re-transmitting slidewire or pneumatic transmission unit, adapt the *ElectroniK* flow meter to a variety of interlocked systems. The flow transmission system permits remote location of the meter.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

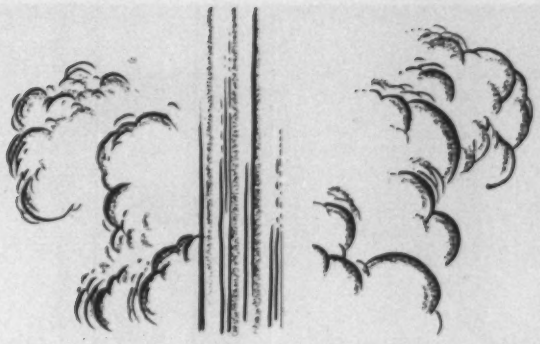
MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

75th YEAR — PIONEERING THE FUTURE

Honeywell

First in Control

SINCE 1885



The year 1959 will be identified as one of high hopes and frustrations. The sharp recession of 1958 had unbalanced the economy, but the prospects for a full recovery were unmistakable.

The year 1958 was the crucible which produced a wiser and more capable management. Severe losses encouraged belt tightening, the pruning of executive deadwood. Management, after many soft years, was finally working from strength.

At the onset, 1959 looked promising. But management faced unpalatable labor demands and the increasing threat of foreign competition.

Here is what happened.

January

Steelmaking capacity has been increased to 147,633,670 tons. Estimated production for the year is 110 million tons.

U. S. iron and steel producers expect to lay out more than $1 billion in capital expenditures this year. Spending will be predominantly for new oxygen furnaces.

American concern about international trade is real and immediate. Reasons: 1. Strength of the European Common Market. 2. Devaluation of the French franc.

Steel imports are major competitive force in Southwest. Prices average $20 to $40 a ton below domestic level.

U. S. firms are contracting with overseas universities and research centers for R&D work. A number are setting up research centers in Europe.

Reynolds Metals Co. gains control of British Aluminium Co. Ltd. Reynolds now has a solid foothold in the European market.

Attention marketing men: Bureau of Census revises population figures, expects a population of 235.2 million by 1975.

U. S. auto output to exceed 5 million this year vs. 4,243,374 in 1958.

Depreciation reform is gaining proponents. Success hinges largely on support from industry.

USW begins campaign to woo public. Newspaper advertisements, ostensibly aimed at autodom's rank and filers, preach indirect benefits to them if USW wins demands.

Homebuilders predict that 1.2 million houses will be built during year. Aluminum and plastic becoming important contenders as building material.

Employment climbs. January figure is 62,706,000, a record for that month. Five million are still unemployed. Concerned government might act on interest rates, depressed area aid, import controls, unemployment compensation, and other factors affecting business.

Steel industry enters New Year

(*Please turn to Page* 354)

Enthusiasm is no substitute

It's no sin to be enthusiastic.

But it takes experience to get uniformly satisfactory results.

It's the experience we've picked up in over a quarter-century making metal abrasives that pays off for our customers.

We were the first to produce steel shot and grit on a tonnage basis in this country. Our engineer-salesmen, through the years, have run into just about every cleaning problem that has ever come up. They know cleaning equipment. Further, they know what long-lived quality abrasives will do — in fast cleaning. And if they don't know the answer to a given problem, right off, one of our metallurgists will take a flying trip to your plant, with the answers.

So, whether it's brass, aluminum, or steel that you're dealing with, whether it's slab, sheet, heat-treated parts, forgings or castings, one of our abrasives will do the job for you — when it's properly applied.

Let us show you what AMASTEEL, AMABRASIVE, ENAMA-STEEL, ALECTRA shot and grit can do in your cleaning room. Our engineer-salesman has a portable testing ma-

for Experience!

chine which will test-prove our product right before your eyes, in your plant.

If you're worried about production losses because shipments are late, count on us. We stockpile finished and unfinished shot and grit in a variety of hardnesses and sizes. It's here, ready for shipment to you on a rush order basis.

Want to know about the most complete selection of abrasives ever offered? Write for our Catalog No. 591.

AMASTEEL

the man from Alloy Metal

ALLOY METAL ABRASIVE COMPANY
121 South Division Street
Ann Arbor, Michigan

(*Continued from Page* 351)

financially sound. Working capital of 33 companies is at an all-time high of $3.3 billion. (They account for 94.15 per cent of the industry.)

February

Antitrust Division of Justice Department subpoenas GM records dating back to 1929 for presentation to grand jury. It is the first step in the government's attempt to split GM into two or more manufacturing companies.

Flash floods in the East hit metalworking plants, forcing shutdowns.

Steel output is running at a yearly rate of about 125 million tons.

The 1959 steel parleys are the most publicized in industrial relations history. Stockpiling, in anticipation of a strike, is already underway. Operations average 78.6 per cent of capacity the first two months.

Bethlehem Steel Corp. and Youngstown Sheet & Tube Co. won't appeal decision barring their merger.

Strike at Pittsburgh Plate Glass extends to 134 days before settlement is reached.

World capacity in steelmaking is 25 per cent above 1955 level. U. S. capacity is up nearly 18.9 million tons.

Italy's largest iron and steel producer, the Finsider Group, plans direct competition with other steel organizations in European Common Market.

Japan begins "Yankee go home" talk because of mounting imports of Alaskan products—lumber, pulp, coal, iron, and oil.

Rail industry prepares campaign to expose featherbedding. Undercurrent to modify corresponding practices in steel industry is gaining strength

March

Squabble over interpretation of Buy American Act. Westinghouse and GE protest purchase of turbines from England for TVA

Steel talks to open in May at New York. R. Conrad Cooper, vice president of U. S. Steel, will lead management's bargaining team. Uncompromising attitude of USW prophesies bitter strike. Ike voices opinion on impending negotiations. Suggests that the companies and unions consider public welfare. Wants costs to remain at present level.

Inventory buildup by customers falters. Steel is being consumed as fast as it is received.

German auto production up 25 per cent. Exports zoom 25.5 per cent, account for 49 per cent of production.

Ford Motor Co. will spend $35 million to modernize its steelmaking facilities at the Rouge Plant (Dearborn, Mich.). Blast furnace capacity will be increased, and open hearths will be renovated for increased use of oxygen.

Steel production sets monthly record (11,567,000 net tons) in March, says American Iron & Steel Institute. Previous record: 11,048,513 net tons in October, 1956.

Kennedy-Erwin Bill meets powerful Senate opposition. Tougher measures by Senators Curtis and Mundt favored. Labor opposes McClellan Bill because of threat to lose tax exemption privileges and NLRB recognition.

Shrinking rail market eliminates all but three producers. They're the big ones: U. S. Steel Corp., Bethlehem Steel Co. and Colorado Fuel & Iron Corp.

April

GM-Du Pont ruling near in antitrust proceedings initiated by government. U. S. proposes disposal of GM stock owned by Du Pont: Sell 20 million shares on the open market, distribute 41 million shares to Du Pont stockholders.

Scrap prices weak in midst of steelmaking boom. One reason: Mills prefer hot metal to increase open hearth efficiency.

Rising imports and declining exports undermine prospects for full employment. U. S. firms are looking to Europe to set up production facilities and profit from lower manufacturing costs.

Atlantic Steel Co. petitions Tariff Commission to investigate damage caused by imports of fencing, wire, and nails.

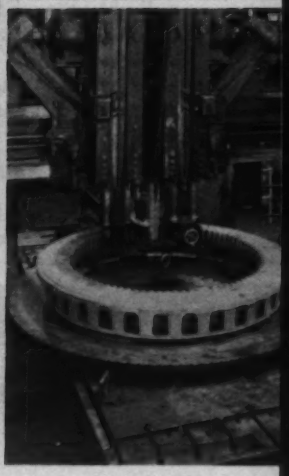
Management and labor voice views on productivity, indicating bitterness of coming wage talks. Steel unions claim productivity is merely output per manhour. Companies contend that far more must be taken into consideration, including equipment costs, taxes, maintenance expenses, and other overhead. The steel industry's chief negotiator, R. Conrad Cooper, will seek a noninflationary pact. USW President David J. McDonald will ask for a 30 per cent package increase.

Steel production in the first four months is 70 per cent above last year's pace. Some 1200 steelmaking furnaces poured about 41 million net tons of steel.

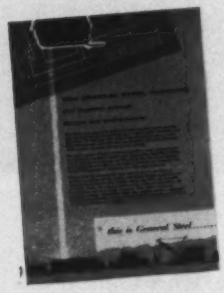
May

Steel union demands include a spread-the-work proposal designed to create employment for the 50,000 steelworkers now idle. Gist of

...where industrial progress is cast in steel



PRODUCTION FACILITIES... COMPLETE AND MODERN



Write for folder: **How General Steel Castings Can Improve Product Design and Performance.** General Steel Castings, Station 230, Granite City, Illinois.

General Steel's large plants have complete facilities for producing, testing and machining castings to your specifications. Here are the facilities needed for quality production to suit your specialized requirements in cast steel structures . . . and steel castings used in cast-weld and composite structures.

Each plant maintains its own pattern, core making and molding departments, staffed by skilled craftsmen. Melting facilities capable of producing the correct steel for castings weighing up to 100 tons are complemented by the most modern foundry equipment available. Modern cleaning and finishing equipment, extensive heat treating facilities, specialized machine tools and the latest in non-destructive testing . . . radiographic, magnetic particle and ultra-sonic inspection devices . . . complete the picture.

General Steel's services range from application analysis before the product is designed to field service after the product is in use. Let us demonstrate how cooperative teamwork can make all this skill and knowledge available to you.

GENERAL STEEL CASTINGS

GRANITE CITY, ILL. · EDDYSTONE, PA. · AVONMORE, PA.

proposal—four day, 32 hour week every fourth week.

Foreign steel producers sent a record volume of steel mill products (384,787 net tons) into the U. S.

Record steel shipments (8.5 million to 8.75 million tons) will carry the industry to the biggest quarter in history.

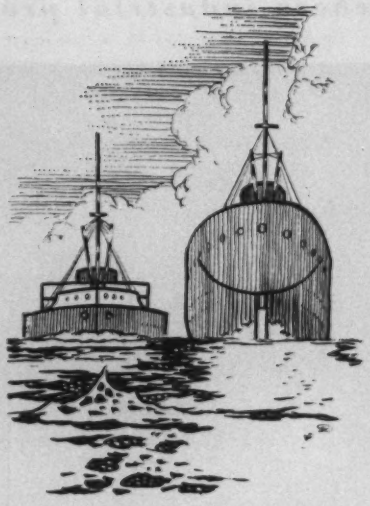
Buffalo receives second substantial steel shipment since Seaway opened. About 3000 tons of used rails from Scotland, to be rerolled into fence posts, signposts, and rebars, are unloaded at the port.

If steelworkers strike July 1, slightly more than 12 per cent of the industry will continue to operate. Monthly output will be less than 1.5 million tons. Some mills are captive shops, and a few are specialty producers.

R. M. Blough, chairman, U. S. Steel, denounces proposed Price Notification Bill. Charges that bill would control industrial prices by administration whim.

June

Union agrees to postpone strike for two weeks. Industry stands pat,



Imports continue to take a bigger share of American markets. Estimates are that they will account for about 6 per cent of new steel supply. The U. S. is becoming a net importer of steel

wants wage freeze, changes in work rules. Union reduces demands to 15-20 cents an hour.

Strike threatens nonferrous market. On June 30 contracts expire at 27 copper mines and refineries in the U. S.

Steel users have upped inventories from 13 million to 19.5 million tons since first of year.

Scrap prices climb. No. 1 heavy melting grades advance to $36.50 a ton. Export demand is bolstering the market.

Steel mill shipments reach an all-time high of 48,156,396 tons in the first half—a record for any half-year period, American Iron & Steel Institute figures show.

A record 9.7 million tons of steel are shipped in June.

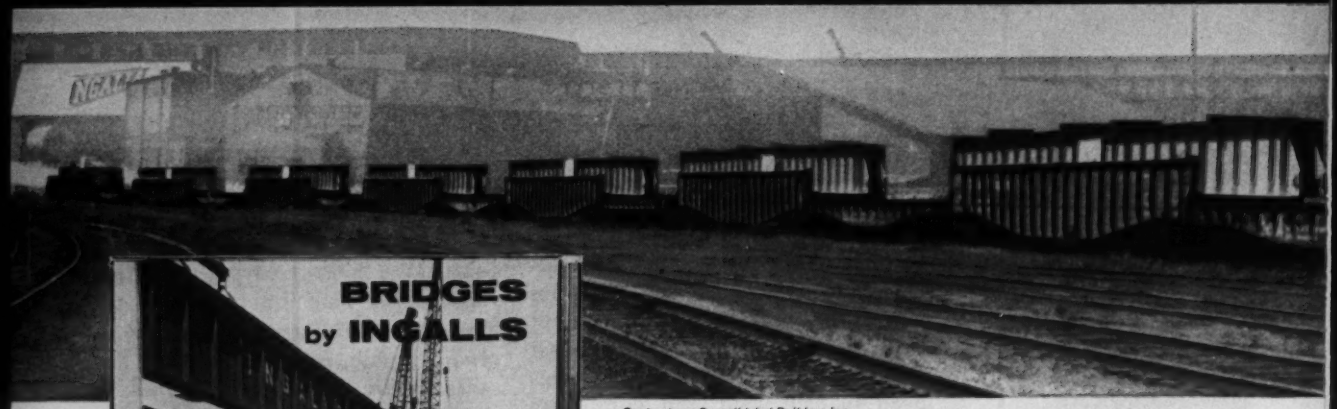
June imports of iron ore, aluminum and aluminum manufactures, refined and unrefined copper, nickel oxides, and tin ores establish a record, announces the Department of Commerce.

U. S. exports slipping badly. Foreign steel is being shipped into the U. S. at more than triple the year-ago rate. Exports during 1959's first half are 222,282 tons below the level of 1958's first half.

July

Steel imports set record in July (430,000 net tons). Total for the

16-CARLOAD "GIRDER EXPRESS"



Contractors: Consolidated Builders Inc.
Engineers: C. A. Maguire & Associates, and Massachusetts Department of Public Works.

Down the line rolled Ingalls' special "Girder Express" . . . on the job, and on time 4 days later . . . after a 1170 mile journey. Destination: Worcester Expressway Bridge, Worcester, Massachusetts.
Cargo: 32 Ingalls' steel fabricated bridge girders – each 93′ 3″ in length.

FREE Write for this new, fully-illustrated brochure featuring bridges by Ingalls.

first seven months of 1959 was 2.3 million tons. Belgium-Luxembourg supplied 40 per cent; Japan, West Germany, France—15 per cent each; UK and Canada follow. Imported steel prices becoming firmer and increasing. The rise is credited to increased demand here and abroad.

Foreign orders for metal cutting and metal forging machine tools total $10 million in July, the biggest monthly influx since October, 1956.

Steelworkers—500,000 of them—hit the bricks on July 15. (Steelmaking operations immediately fall to 12.9 per cent of capacity.) Chief point of disagreement: Management insists on reviewing work practices. Union wants to postpone discussion until next contract.

Losses after three weeks of strike: Lost steelworkers wages: $135,200,000; lost steel sales: $378 million; lost steel production: 3,680,300 ingot tons.

Buy American Act questioned by Baldwin-Lima-Hamilton Corp. Six per cent margin designed to aid in bids against foreign competition claimed discriminatory against U. S. firms.

Going, going, gone—500,000 steelworkers hit the bricks

to reflect higher costs in U. S.

Service centers sales are 25 to 30 per cent ahead of May's.

August

Contract extensions have permitted the steel industry to hold its operating rate fairly steady at around 13 per cent of capacity.

Steel import prices strengthened during recent weeks. Some have pushed up to domestic levels. Steel continues to come in at Atlantic, Gulf, Pacific, and Great Lakes ports.

Aluminum contracts are extended until after steel dispute is settled. If the USW and companies haven't reached settlement by Nov. 1 or 30 days after the end of the steel strike, present agreements may be terminated by either party on ten days' notice.

Kennecott is struck by Mine, Mill & Smelter workers. Anaconda is struck in Montana, and with Phelps Dodge units out, less than 25 per cent of copper production will be active.

House passes Landrum-Griffin Bill; Senate passes Kennedy-Erwin Bill; both are being considered by Senate-House conference committee.

New York Power Authority has ordered 7000 tons of steel for transmission towers from an Italian firm which bid 40 per cent under the lowest U. S. bid.

Exports of steel mill products drop to new low during August,

FROM INGALLS

Transportation of the huge girders required 8 heavy-duty flat cars and 8 of the longest gondolas in normal use.

Whether your next job calls for a carload or a trainload of fabricated structural steel . . . you're on the right track for first-class service, express deliveries, and economy rates when you call – Ingalls.

STEEL PLATE FABRICATORS ASSOCIATION FOUNDED 1933

AISC

THE INGALLS IRON WORKS COMPANY
Executive Offices
BIRMINGHAM, ALABAMA

bringing total for 1959's first eight months to only 1.25 million tons.

September

Steel negotiations collapse. A concerned President Eisenhower calls Messrs. Blough and McDonald to White House for separate talks.

Steel strike is 55 days old on Labor Day, equaling the record for the longest postwar walkout in industry.

AFL-CIO gives $1 million for USW support.

Trading between warehouses and customers becoming practice as search is made to free grades overstocked by some.

Steel strike affects aluminum orders. Customers consuming both are hampered because of steel shortage.

General Motors negotiating with Phoenix Steel Corp. for excess steel. Chrysler completes an agreement with Lone Star Steel for the same reason: Shortages.

Great Lakes fleet operations cut to 15⅓ per cent by strike. Of the 243 boats of the M. A. Hanna Co. fleet only 37 are in operation—most are in the coal and grain trade.

Landrum-Griffin Bill, first revision in labor reform legislation since the Taft-Hartley Act was passed 12 years ago, is approved by the Senate 95-2, by the House 352-52.

October

Imports of steel maintain their lead over exports for the eleventh consecutive month in October. Imports had a 2 million edge in the first ten months of the year. Imports through October total 3.4 million tons; exports through October total 1.3 million tons.

President invokes Taft-Hartley Act, asking for court injunction. Eisenhower says strike endangers national defense. USW attacks constitutionality of T-H through court action. Stay granted until injunction is reviewed by Third Circuit Court of Appeals at Philadelphia. T-H injunction upheld by court. Stay extended until Nov. 2. USW will appeal to Supreme Court.

Kaiser and USW reach agreement on separate pact. The pact will improve fringe benefits for first year and provide wage increase in second.

Nearly a quarter of a million workers in steel-using plants are laid off because of the metal's shortage.

Steel output at three month peak of 13.1 per cent capacity.

Imports of iron ore are running about 20 per cent greater this year than last, reflecting impact of strike.

Shortage of sheet steel due to the steel strike is threatening Britain's booming auto industry.

Russian foundry grade iron (3000 tons) is landed at Detroit. Importer is Primary Industries.

Ford expects to make 1.6 million cars (6.3 million for all of motordom) in 1960, 25 per cent of which will be Falcons.

The Lark is a success. Studebaker's sales for first nine months were $284,909,940, including $75,093,169 in the third quarter. Nine month sales in 1958 ($92,005,696) resulted in losses of $22,532,511.

U. S. Steel reports it lost $31,135,135 during third quarter. It had net income in the 1958 third quarter of $74,922,924. Inland Steel Co. reports first loss in 25 years. Net loss for the third quarter is $7,499,109. Bethlehem Steel has a $38,926,913 loss during the third quarter.

Steel service center stocks have dropped 46 per cent since start of the strike. Most popular sizes and gages are in short supply.

Federal Judge Walter J. La Buy rules that Du Pont may keep its $3.5 billion worth of stock in General Motors.

Reform of the Buy American Act may become one of the big issues affecting metalworking in the session of Congress starting in January.

U. S. is buying more goods from Great Britain than we're selling to her for the first time since 1865. Great Britain is planning a major exhibit of her goods in the New York Coliseum in 1960.

November

Losses in 116 days of steel strike: Lost steelworkers' wages: $1,172,500,000; lost steel sales: $3,493,000,000; lost steel production: 32.7 million ingot tons.

Layoffs due to steel shortage may peak at around 500,000 and hold

Supreme Court upholds T-H injunction. Furnaces fired after being idle 116 days. Race is on to accumulate ore before the winter closes Great Lakes

there until mid-December.

Resumption of steel shipments creates shortage of freight car supply.

As a result of the prolonged steel strike, the economy will follow a boom trend throughout 1960. If there is to be a recession following this boom, it will probably start in the first quarter of 1961.

Nonsteel bargaining sessions are in aluminum, copper, and the railroads. Aluminum companies keep operating; much of copper industry is out on strike.

Federal mediators enter railway labor disputes to avert rail walkout in early 1960. Biggest issue will be featherbedding.

UAW raises dues to $5 a month. Main reasons: 1. To finance white-collar drives in auto, farm equipment, and aircraft industries. 2. To push for shorter workweek. 3. To build up strike funds.

Copper leaders view future confidently. They expect usage to grow 3 to 4 per cent annually in the next decade. Demand will increase faster in Europe than in the U. S.

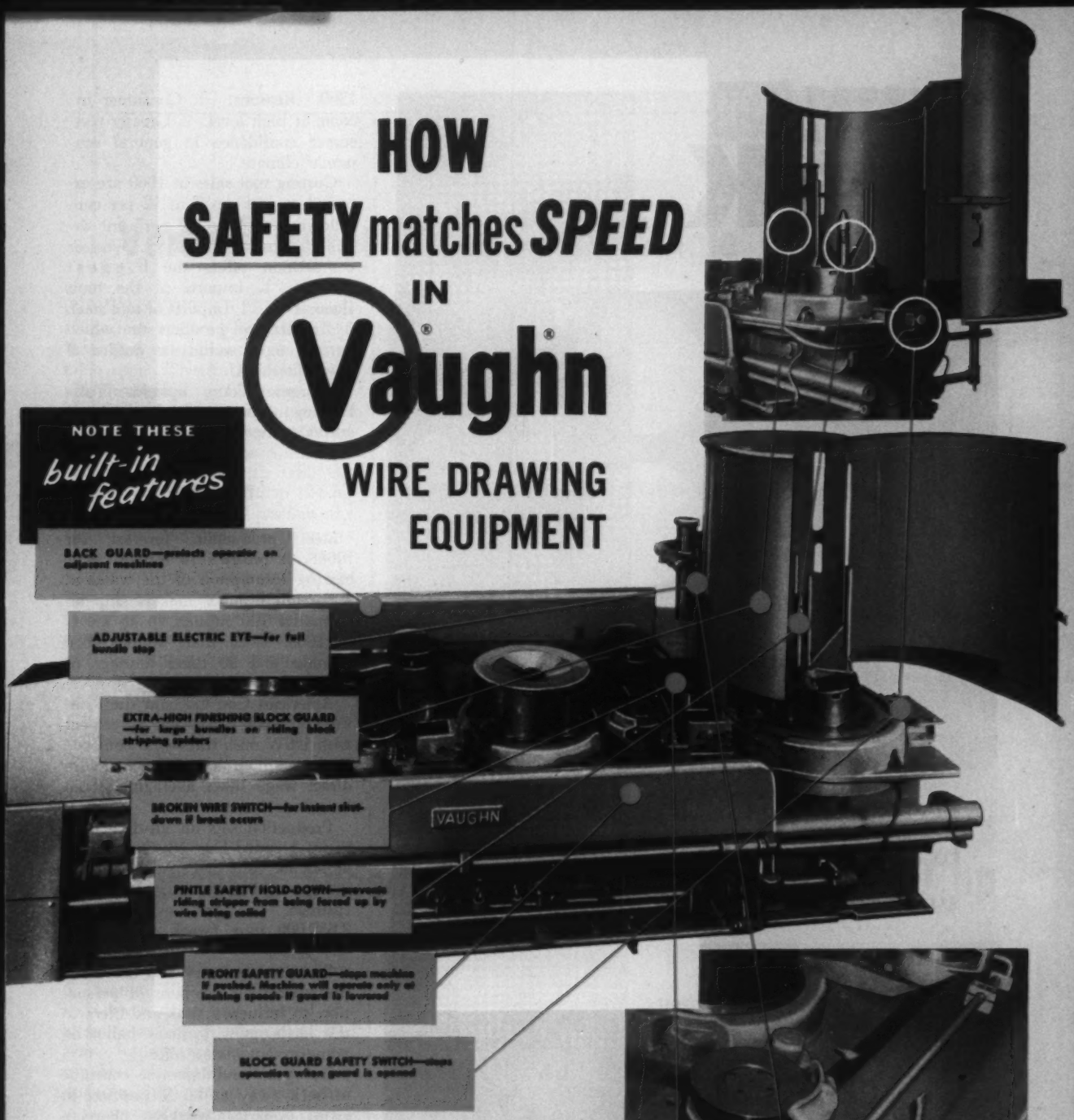
Production of motor vehicles passes 6 million mark.

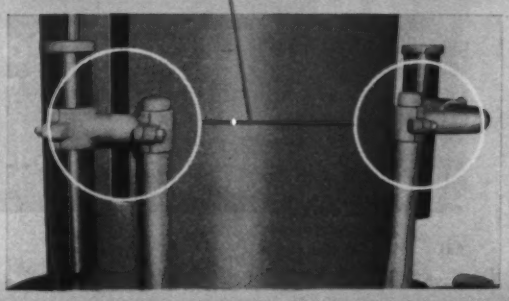
Use of aluminum in 1960 car models increases 13 per cent. Estimated average is 56.2 lb vs. 49.6 lb in 1959 models.

Edsel is discontinued by Ford.

Economists at the University of Michigan foresee a durable goods spending spree by consumers in

HOW SAFETY matches SPEED IN Vaughn WIRE DRAWING EQUIPMENT



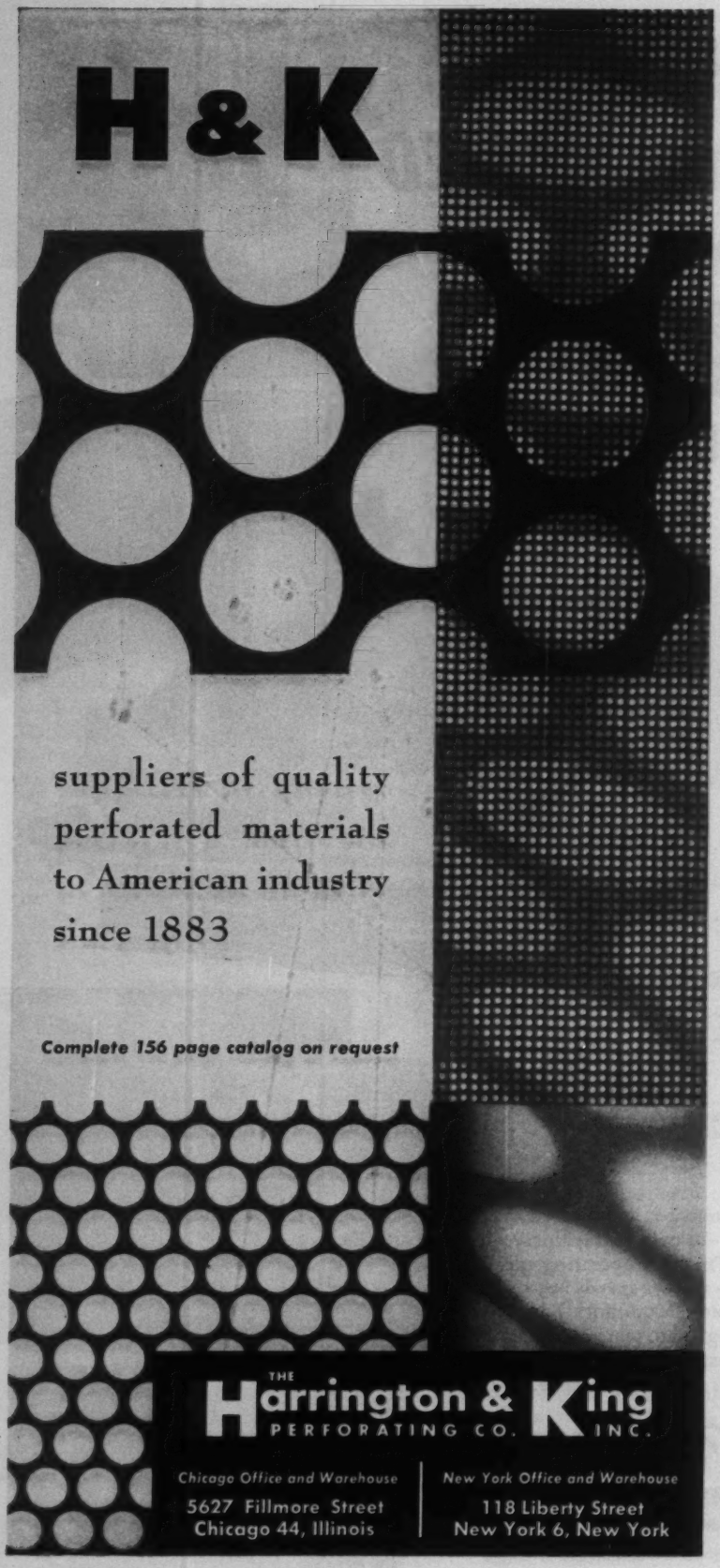


SAFETY for men and equipment is engineered thoroughly into Vaughn Wire Drawing Machinery—in every type, in every model. The high operating speeds of modern Vaughn machines are *safe* speeds because of this engineering. Our Motoblox, Motoblocs, Ringblox and other equipment are designed to match *productivity with protection* over the widest range. Let us detail our many safety developments, at your convenience.

"Quick on the Draw!"

The VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.



1960. Reasons: 1. Consumer income at high level. 2. Greater consumer confidence in general economic climate.

Cutting tool sales in 1960 are expected to pick up 7 to 12 per cent following a 50 to 60 per cent decline in business in 1958. Overseas competition offers the biggest threats: 1. Imports of the tools themselves. 2. Imports of tool steel. 3. Imports of products on which cutting tools would be needed if made in the U. S.

Supreme Court upholds Taft-Hartley injunction. Steelmaking operations are resumed on Nov. 7.

December

Steel production forecast for 1960: A record 130 million tons, barring resumption of the walkout.

Foreign fastener makers ship an estimated 120 million lb to U. S. in 1959, more than double 1958 tonnage and 30 times tonnage in 1951.

American Can Co. and the Continental Can Co. reach agreement with USW on a three-year contract. Package amounts to 28.2 cents, with direct wage hikes averaging about 8 cents per year.

Production sets an all-time peak in week ended Dec. 13. Output was at 95 per cent of capacity—2,690,000 net tons of steel for ingots and castings. The previous high was 2,657,000 tons (week of Apr. 19, 1959).

The steel industry and the USW unlimber their weapons of persuasion to influence rank-and-filers in the forthcoming January ballot on management's latest offer.

European and Japanese continue to hack away at U. S. position in Latin America markets. Foreign competitors now account for around 30 per cent of Latin America's imports.

Blaw-Knox Co., Koppers Co., and Westinghouse Electric International Corp. are slated to build an integrated steel plant for the Turkish government. The cost: $144 million.

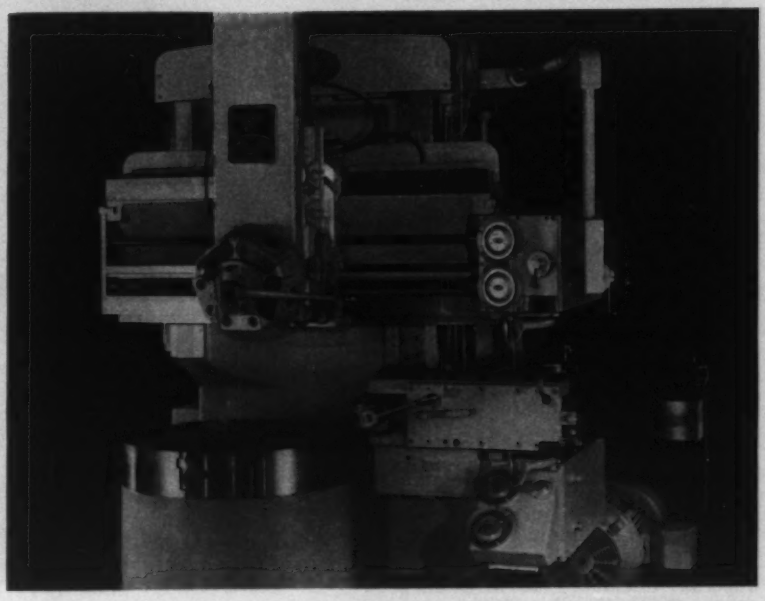
Kaiser Industries Corp. has announced conclusion of contract between Renault and the Argentine affiliate of Willys Motors for the manufacture of the Dauphine car in Cordoba, Argentine.

Vertical Turret Lathes Have Single Lever Control

POWER CONTROLLED, vertical turret lathes offered by Bullard Co. have feed rates directly coupled to table rpm. They're infinitely variable throughout the full range. Variable traverse rates range up to 9 ft per minute. The series (called Dynatrol) replaces the Cutmaster and has nine sizes with table diameters ranging from 26 to 124 in.

A single lever control positions the heads and engages or disengages tools from the work. No handwheels are used. The control system shortens and simplifies the operating cycle. The operator can move the heads to position faster, put the cutting tool closer to the work before engaging the feed, and set the table in motion smoothly.

For further information, *write* Bullard Co., Canfield and Key Streets, Bridgeport 9, Conn.



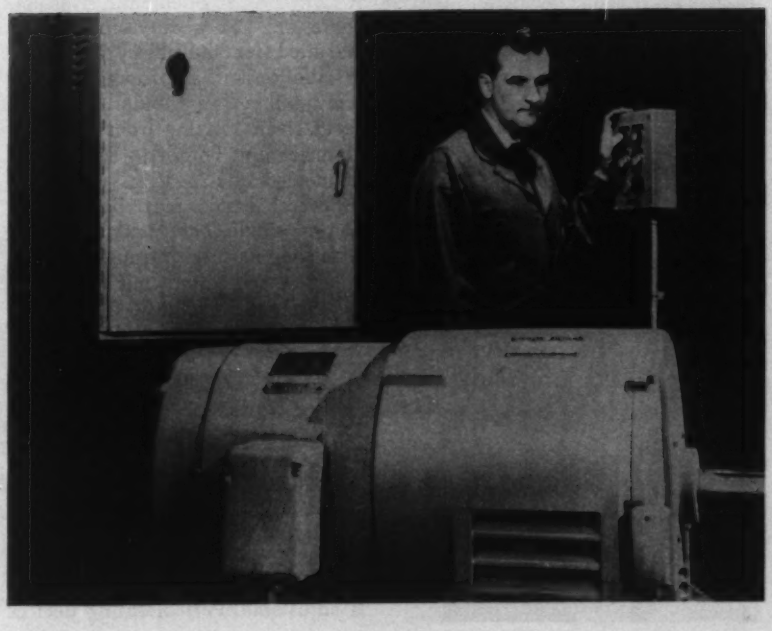
Adjustable Speed Drives Rated from 5 to 100 hp

EDDY CURRENT coupling, adjustable speed drives are rated from 5 through 100 hp. The package includes a drive unit, control enclosure, and operator's control station. Ratings through 20 hp are capable of continuous operation down to 100 rpm at rated torque with an approximate speed range of 17:1.

Automatic control provides close speed regulation. On a typical friction type load, regulation of 2 per cent of full speed can be obtained with standard equipment.

The ac motor and eddy current coupling, adjustable speed member are integrally designed for compactness. Rotating windings, brushes, and slip rings have been eliminated. The stationary field coil and tachometer generator coil are encapsulated in epoxy resin.

Efficient coupling ventilation



makes possible the small physical size and wide speed range of the drive unit.

The control enclosure includes an exciter-regulator (electronic or amplistat) for coupling control, and may also include ac motor starter and short circuit protection. Wiring is the front-of-board type.

For further information, *write* Direct Current Motor & Generator Dept., General Electric Co., Erie, Pa.

Lock Seam Adapter Folds Metals Up to 16 Gage

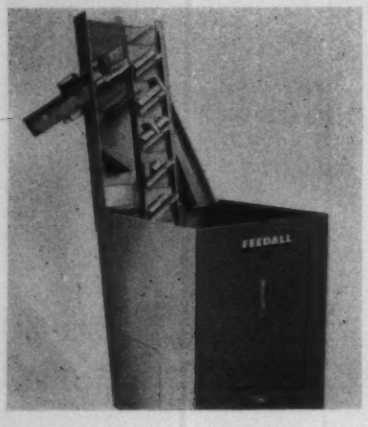
LOCK seam adapters for small air hammers can be used to fold over or seam heavy metal up to 16 gage. The manufacturer says operators require no special training or skill.

Fabricating shops using the adapter report: One operator's production equals that of eight hand hammering workmen. The finished seam is neater and more uniform.

For further information, *write* Superior Pneumatic & Mfg. Inc., 13800 Enterprise Ave., Cleveland 35, Ohio.

Multispeed Part Feeder Has Low Loading Height

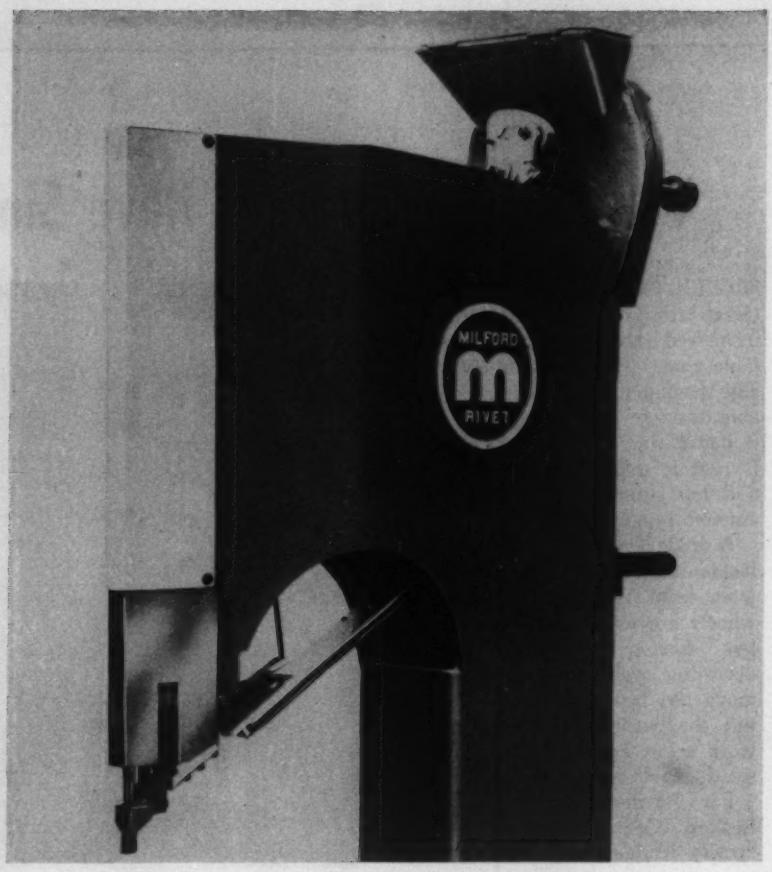
THE Model 3000 part feeder can be preset to desired feed rates. Automatic bank controls maintain continuous flow of parts such as round steel slugs 3¼ in. in diameter by 5 in. in length. The feeder shuts off when the feed track is fully loaded and resumes operation automatically upon demand.



It has a 25 cu ft hopper, a low loading height, a 12 in. belt width, and a special self-emptying bottom. The elevating angle of the conveyor is adjustable. Part orienting devices can be applied on the elevating cleats, tooling plate, or the delivery track.

For further information, *write* Feedall Inc., 38399 Pelton Rd., Willoughby, Ohio.

(*Please turn to Page* 364)



Need Machine for Clustering?

A COMPACT, pneumatic rivet machine for heavy duty applications is suited for multihead or cluster installations. The Model 57 sets semitubular, full tubular, or bifurcated rivets ranging from ⅛ in. in diameter and length to 3/16 in. in diameter and 1 in. long.

Several heads may be grouped (on a single base and combined with slide fixtures or transfer tables) as one production unit adaptable to automatic cycling. The pneumatically driven toggle linkage operates on 60 to 150 psi shop air pressure. Maximum cycling speed is governed by the rivet feed rate into the jaws. Stroke speed is adjustable to control impact when fragile materials are being assembled.

The unit has a 3 in. stroke and a 12 in. throat depth. Over-all size is 33 x 23¼ in. deep. Rivets can be set on centers down to 1 in. With offset spindles, two heads may be opposed to further reduce center distances.

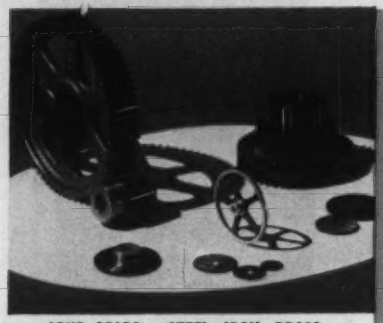
For further information, *write* Milford Rivet & Machine Co., Milford, Conn.

"Why slow up the job with special gears?"

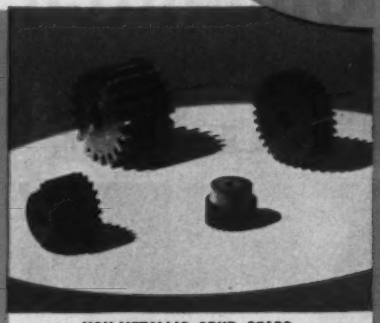
when you can select what you need
from over 2000 standardized

BOSTON GEARS

FROM STOCK
OFF-THE-SHELF
at factory prices



SPUR GEARS — STEEL, IRON, BRASS
14½° and 20° P.A. .208" to 40" P.D.

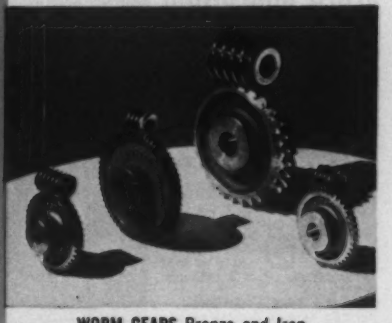


NON-METALLIC SPUR GEARS
14½° and 20° P.A. .938" to 6.667" P.D.

RACK • PINION WIRE
Steel and Brass 14½° and 20° P.A.
PINIONS • INTERNAL GEARS

BEVEL and MITER GEARS
Steel, Iron, and Brass 20° P.A.
.312" to 14" P.D.

STEEL SPIRAL MITERS 1" to 5" P.D.
HELICAL GEARS
Steel and Bronze .333" to 6" P.D.



WORM GEARS Bronze and Iron
.417" to 18" P.D. **WORMS** .333" to 4" P.D.
Soft Steel and hardened and ground steel

9496
STANDARDIZED TRANSMISSION PRODUCTS

Stock Gears
Sprockets and Chain
Speed Reducers
Bearings • Couplings
Shaft Supports
Pulleys

Take a good look through the BOSTON Gear catalog. You'll find standardized types and sizes to fit most of today's transmission needs. Why pay more (and wait) for gears made to order? Design around BOSTON Gear. It saves time and money in planning, in purchasing, in production . . . and you simplify servicing problems. Boston Gear Works, 73 Hayward Street, Quincy, Mass.

Advt. copyright by Boston Gear Works

CALL YOUR
BOSTON Gear
DISTRIBUTOR

For nearest Distributor LOOK UNDER "GEARS" in the Yellow Pages

— STANDARDIZATION PAYS —®

NEW PRODUCTS and equipment

Hanging Magnetic Rack Handles All Sizes, Shapes

EQUIPPED with permanent magnets, the Eriez Magna-Rax can be used with overhead or monorail conveying systems to handle large or small ferrous parts and stampings in operations such as dipping, spray painting, washing, coating, plating, or conveying.

A battery of double ended magnets on a frame holds and carries parts through painting or other operations. Little or no modification is required normally for model changeovers or part redesign.

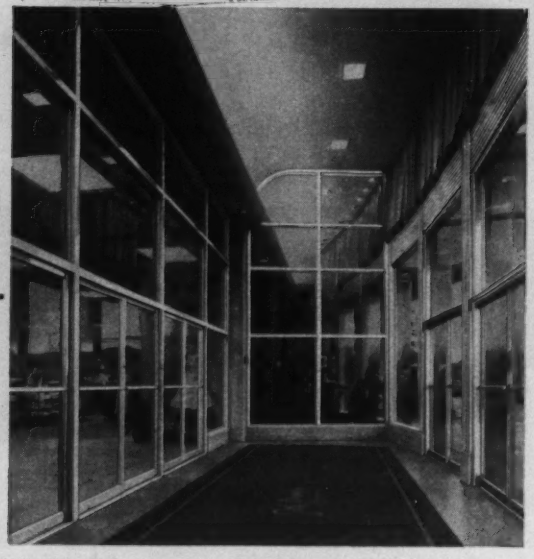
With auxiliary ferrous hangers (held by the magnets) all sorts of small objects, ferrous or nonferrous, may be handled.

Constructed of stainless steel and cadmium plated, the units resist rust. They can withstand temperatures to 750° F.

For further information, *write* Eriez Mfg. Co., 95 Magnet Drive, Erie 6, Pa.

Versatility Unlimited

In the modern store MicroRold Stainless Steel adds elegance.. lessens maintenance



John Wanamaker store Wynnewood, Pa.

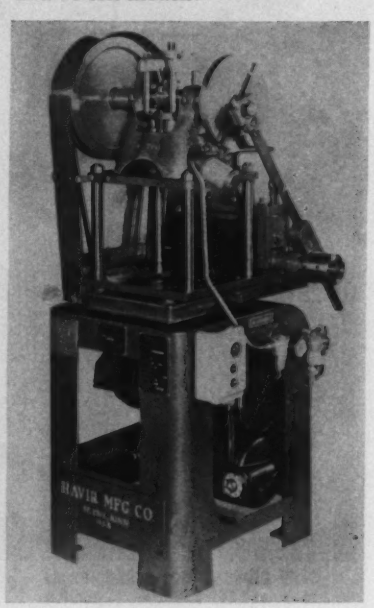
There's no compromise in quality and durability—when you select gleaming, *lifetime* stainless steel for buildings, storefronts and entrances. As a functional and decorative companion to wide glass areas, stainless steel is engineered to perform perfectly—year after year after year. The fact that stainless steel's beauty is permanent—and so easy to maintain—makes it the most practical choice in contemporary design.

Specify MICROROLD STAINLESS SHEET AND STRIP, available from local steel service centers in all architectural grades, thicknesses, finishes and textures. Send for your free copy, Bulletin 259, A.I.A. File 15-H-1, "ARCHITECTURAL STAINLESS ENGINEERING DATA."

Washington Steel Corporation
1-O WOODLAND AVENUE
WASHINGTON, PA.

Expanded Bed Presses Have Greater Die Space

YOU can use full press tonnage for die trimming with the new series of expanded bed Havir presses. A 12 x 12 in. bed is in the 8 ton unit and a 12 x 14 in. bed in the 12 and 16 ton models.



In some cases, the increased die space permits use of a lower tonnage press (than is usually required) to obtain the necessary die space for trimming operations.

For further information, *write* Sales Service Mfg. Co., 2363 University Ave., St. Paul 14, Minn.

High Density Metal Can Be Cold Worked, Formed

A HIGH density metal which can be cold worked and formed, has been introduced by Mallory Metallurgical Co., a division of P. R. Mallory & Co. Inc. The company says the metal (Mallory 3000) can be fabricated in a wider range of shapes than has been possible with other high density metals.

Tests of Mallory 3000 cold rolled to a 52 per cent reduction showed ultimate tensile strength of 195,000 psi, yield strength of 190,000 psi, and proportional limit of 90,000 psi. Modulus of elasticity was 54 x 10^6 psi and elongation was 0.5 per cent in 1 in. At 2000° F, the short time tensile strength was 19,350 psi and

elongation was 5 per cent. Rockwell A hardness was 63.5 at 68° F and 42.5 at 1472° F.

For further information, *write* Mallory Metallurgical Co., a division of P. R. Mallory & Co. Inc., 3029 E. Washington St., Indianapolis 6, Ind.

Vinyl Resin Protects Structurals from Corrosion

STRUCTURAL steel and other metal fabrications can be protected from chemical attack and weathering with a spray coating based on Bakelite vinyl resin. Various colors are available for coding.

The coating (Quelcor No. 418) has exceptional dielectric properties. The material resists most petroleum fractions (including gasoline), greases, acids, and solvents. It forms a smooth film that dries to the touch in 1 hour.

For further information, *write* Quelcor Inc., Front & Broomall Streets, Chester, Pa.

Attachment for Lathe Threads Plastics, Metals

THE Fen-Thread-Miller is a compact, portable unit that can be quickly attached to lathes for accurately threading plastics and metals. It's ideal for cutting multiple threads. A complete setup can be made in 4 to 5 minutes by one man.

The pitch diameter, root, and pitch angle are held to a tolerance of 0.001 in. Only one pass is required to thread-mill any 60 degree Acme or square thread. It can thread right up to the shoulder without undercutting. Parts may be machined with or without coolants.

You can get cutters ranging from 1/32 to 9 in. for external threading, and from ½ to 9 in. for internal threading. Any 9 in. to 20 in. screw cutting engine lathe can be used. (Cutting capacity of the lathe should be 4 to 200 threads per in.)

For further information, *write* Fen-Thread-Machine Co. Inc., 3107 N. Broad St., Philadelphia 32, Pa.

Contact Sheet Prevents Water Stains on Aluminum

YOU can combat water staining of stacked aluminum sheets with a contact sheet called Alumitex. The company says it can also protect aluminized steel, galvanized steel, magnesium, and copper.

Alumitex must be placed in direct contact with the metal. You can get 20 and 35 lb weights. Rolls are stocked in 24 and 48 in. widths, 100 yards in length. Bags, sheets, and

ROHCO®

BETTER METAL FINISHES FOR YOUR PRODUCTS

FOR ZINC PLATING

ROHCO 503 STILL OR BARREL ZINC BRIGHTENER (LIQUID)—produces jewel-like bright zinc deposits; ideal where one brightener is desired for all your bright zinc baths.

ROHCO 100 AND 100 SPECIAL BARREL BRIGHTENERS (LIQUID OR POWDER)—the most widely used of all barrel zinc brighteners; brilliant, bluish deposits directly from the plating tank.

ROHCO 175 BARREL BRIGHTENER (POWDER)—the newest addition to the ROHCO series; somewhat less brilliant deposits than with ROHCO 100 but at lower cost.

ROHCO 150 (POWDER) AND PERMA-BRITE B-150 (LIQUID) BARREL BRIGHTENERS—the most economical barrel brighteners on the market; for maximum brightness a bright dip is required.

PERMA-BRITE S-400 STILL BRIGHTENER (LIQUID)—somewhat less brightness than with ROHCO 503, at lower cost.

ROHCO ZW-600—wetting agent for cyanide zinc baths. Eliminates scum on the surface, lowers drag-out, and improves plating bath operation in both barrel and tank.

ROHCO ZINC-SOL—double strength, purified make-up or replenishment solution for instant bright plating.

ROHCO ZINC PURIFIER—to keep baths in tip-top shape for unfailing quality and appearance.

RODIPS—short-dip chromate treatments supplied as powders to brighten, passivate, and protect zinc plate for improved corrosion resistance and color retention. Receptive to subsequent absorption of dyes for color identification of parts.

FOR CADMIUM PLATING

ROHCO 20XL and SUPER XL (LIQUID OR POWDER)—tops for producing the clearest, brightest barrel, or still cadmium; minimizes cadmium usage by improving uniformity and speed of deposit.

RODIP CD-3 and CD-4—single short-dip chromate post-plating treatment without leach for brilliant cadmium and good corrosion protection; CD-3 for automatic tank or barrel, CD-4 for manual operations.

CAD-SOL—a heavy solution of cadmium cyanide for easiest bath make-up or maintenance.

FOR CHROMIUM PLATING

ROHCO ANTI-SPRAY—produces foam blanket which eliminates chrome mist, safe for hard chrome baths.

ROHCO SUPER NO-CRO-MIST®—safeguards workers' health by eliminating chrome fumes, solves ventilating and heating problems; saves chromic acid.

FOR ALUMINUM

ANODICATOR THICKNESS TESTER—an approved, new instrument for electrically checking thickness of anodic coatings. Completely automatic.

RODIP AL-44—additive for aluminum bright dips. Produces increased luster at lower temperature and suppresses acid fumes.

RODIP AL-50—single dip chromate treatment for aluminum and its alloys to give outstanding corrosion resistance and/or excellent bonding of paint.

FOR ALL PLATING

ROHCO RINS-AID®—water-shedder additions to rinse cycle to improve drying and to prevent staining.

RECTIFIERS—for Hull Cell tests and/or plating operations. Complete range of capacities from 5 amperes up, with output to give 5% or less ripple. Optional automatic timers for 5 to 50 ampere units.

HULL CELLS—used world-wide for control of plating baths. Porcelain or molded polyethylene in 267 ml. capacity. Clear lucite in 267 ml. and 1,000 ml. capacities with or without heater and thermostat.

ELECTRIC HULL CELL AGITATOR—new type oscillating variable-speed to reproduce tank operation.

ROHCO SAMPLING TUBE—unbreakable lucite. Designed for perfect sampling of plating baths without mess or fuss.

HANGING HULL CELL—the only available device for making Hull Cell plating tests under production conditions.

And remember, ROHCO offers a complete line of equipment and chemicals for all your plating needs!

---------Nationwide Stockpoints---------

R. O. HULL & COMPANY INC.

1309 Parsons Court • Rocky River 16, Ohio

The RIGHT START . . . to BETTER FINISH

die cut shapes can be obtained on special order.

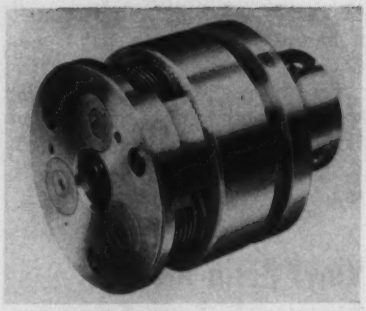
For further information, *write* Orchard Paper Co., 3914-24 Union Blvd., St. Louis 15, Mo.

Thread Rolling Heads Are High Production Type

THE Landis No. 3½ Series thread rolling heads are made in stationary and revolving styles to cover a UNC and UNF range from ¼ to 7/16 in.

The stationary head is adaptable to turret lathes, hand screw machines, and automatic screw machines. The revolving head is designed for automatic screw machines. Both types can be applied to threading, drilling, and tapping machines.

The 3½ Series has replaceable helix angle bushings. With a mean angle, one set of standard bushings is sufficient to roll all UNF and UNC threads with the head range. The proper helix angle bushings



can be substituted when an exact helix head is necessary.

Other advantages: Threads can be produced at high speeds without impairing roll life. Rolls never require regrinding. The thread rolls are designed to be reversed and both ends used. Cage needle bearings are used for servicing ease.

For further information, *write* Landis Machine Co., Waynesboro, Pa.

Solid Film Lubricant Can Take Vacuum Service

A SOLID film lubricant for use in a vacuum has been designated Lube-Lok No. 1005. The lubricant (a ceramic bonded, molybdenum disulfide) has been tested successfully in environments where lubricants containing organic binders would have prohibitive outgassing.

Test results also show extended wear life. It lubricates in temperatures up to 700° F in the presence of not more than 1 per cent free oxygen.

For further information, *write* Electrofilm Inc., P. O. Box 106, North Hollywood, Calif.

Strong, Plastic Putty Sets at Room Temperature

A PLASTIC putty (Narmco 3150) which cures into a solid chunk of epoxy resin at room temperature is being used for such applications as trimming the edges of sandwich structures. No special molds or jigs are required. It may be put in place with a putty knife, or spread with a standard caulking gun.

The material consists of a resin and a liquid catalyst (or hardener). They're mixed and applied immediately. Within 15 minutes, the putty

GLOBE SUPERIOR LADLE BRICK

SERVING THE STEEL INDUSTRY SINCE 1873 ★

have greater resistance to open hearth slag. Their use helps improve metal handling, and reduces cost per ton.

We guide our business on the principles of service and dependability.

LADLE BRICK OUR SPECIALTY

The GLOBE BRICK Co.
EAST LIVERPOOL, OHIO

Short ton or a long ton. No need to be fussy about loading pickling equipment made of Monel alloy. It *stays* strong. And it's easy to fabricate in heavy structures like this pickling hook. Hook was designed and built by Youngstown Welding and Engineering, Youngstown, Ohio for Triangle Conduit and Cable Company.

After 8 years on the pickling line... this Monel hook is as safe and solid as it looks

There's certainty about the strength of a Monel* nickel-copper alloy pickling hook.

Take the Monel hook above. It's just as solid as it looks... all the way through. In fact, in this plant a Monel hook has given over eight years of continuous service in 6% sulfuric acid at 140° F. Only minor repairs.

What makes Monel pickling hooks different?

Monel alloy provides a unique combination of strength and resistance to corrosive attack from sulfuric acid pickling solutions. It's the strongest non-ferrous metal you can use for pickling. And it outlasts other materials many times over.

Because Monel alloy is strong, you can have pickling hooks that are lighter, carry greater loads with less deadweight. No need to allow extra metal to offset corrosion. And here's another saving: you can easily repair Monel alloy equipment after years of service.

Monel alloy is a natural for other pickling equipment, too

Monel slings, chains and tie rods are low in deadweight, tops in corrosion resistance and strength. And in fabricated equipment like baskets, crates and racks, Monel alloy's workability and easy welding properties really pay off. You'll find details about Monel pickling equipment in a 32-page illustrated booklet "Equipping the Pickle House for Greater Production at Lower Cost." For your copy, just write:

*Inco trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

MONEL.®

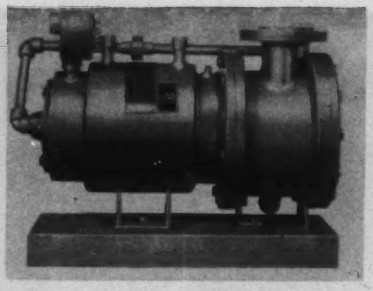
begins to harden and in less than 3 hours (at room temperature) reaches a Barcol hardness of 53 to 60. It may be drilled, tapped, or sanded without signs of cracking or chipping.

You can get additional mechanical strengths by additional curing at temperatures up to 250° F.

For further information, *write* Narmco Resins & Coatings Co., 600 Victoria St., Costa Mesa, Calif.

Two Stage Pumps Handle Heads up to 600 ft

LEAKPROOF pumping at heads up to 600 ft can be handled by a series of two stage, high head pumps introduced by Chempump Div., Fostoria Corp. The rotor, shaft, and impellers of the enclosed unit are a single rotating assembly. Both rotor and stator are enclosed within corrosion resistant, nonmagnetic alloy cylinders. The pumped fluid



circulates through the motor section and cools the motor and lubricates the bearings.

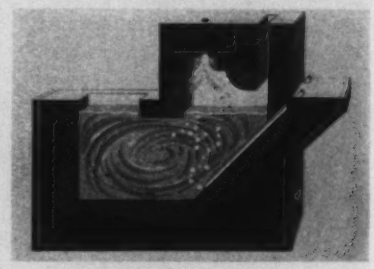
No external lubrication is required. The single unit pump-motor eliminates stuffing boxes, or mechanical seals, and leakage. Series D units for operation under 400° F have water jackets to cool the stator, if required. Models for handling fluids over 400° F are equipped with external heat exchangers. You can get Series D units for 850° F service and pressures up to 3500 psi. They can be modified for vacuum or slurry service.

For further information, *write* Chempump Div., Fostoria Corp., P. O. Box 35-1, Huntingdon Valley, Pa.

Heat Treating Furnace Utilizes Radiation

SALT is heated without using any metal for heat transfer in the gas fired, salt bath furnaces made by Ajax Electric Co. Heating is done by radiation to the bath surface in an enclosed chamber, designed for temperatures up to 2300° F.

The company says it combines the economy of low cost fuels with the heat treating advantages obtained by molten salt immersion. Besides ordinary operations, the



units can handle forgings, billets, castings, and other heavy duty work involving high tonnage volume.

An air bubbler agitator triggers

Precision through Electronics with Cleveland INSTRUMENTS

Dimensional gaging by electronic instruments is generally conceded to be the fastest, most accurate and versatile means available.

The superiority of electronic dimensional gages made by The Cleveland Instrument Company has been proven in the laboratory and in production.

Cleveland Instruments combine:
- Accuracy with ruggedness
- Millionths accuracy with wide range
- Flexibility, reliability and low cost

The preferred and master gages in the majority of industrial and Government gage laboratories, The Cleveland Instrument Company leads the field in the sale of electronic dimension gages.

Cleveland gages offer more in the following fields:

DIMENSION
- Electronic Indicators
- Production Comparators
- Gage Block Calibrators

SURFACE MEASUREMENT
- Roughness
- Profile

RELATIONSHIP
- Roundness
- Concentricity
- Squareness
- Parallelism

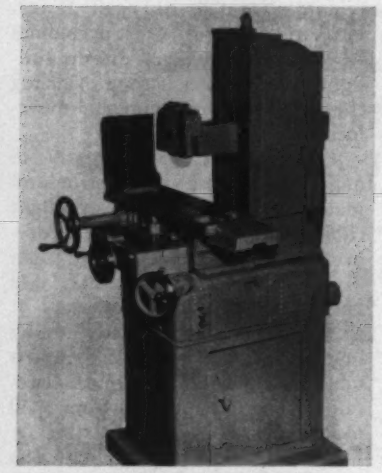
Cleveland INSTRUMENT CO.
6220 E. Schaaf Rd. • Cleveland 31, Ohio
ELECTRONIC Gaging Equipment • Control Systems • Contract Services

a constant circulation that evens out temperature variations. Liquid fuels may be used.

For further information, *write* Ajax Electric Co., 952 Frankford Ave., Philadelphia 23, Pa.

Precision Surface Grinder Is a Hand Feed Unit

A PRECISION surface grinder (No. 7A Covel Excel) is a 6 x 12 in. hand feed unit that is available with a ¾ hp, 3600 rpm, direct motor driven spindle. A 1 hp, 3600 rpm, unit is also available as optional equipment.



The spindle is a superprecision, ball bearing, cartridge type. It's spring loaded for automatic removal of radial or axial play. Bearings are grease lubricated and sealed. The motor is enclosed within the rigid spindle head standard.

For further information, *write* Covel Mfg. Co., Filstrup Street, Benton Harbor, Mich.

Pump Keeps Tools Cool

YOU can increase cutting life and speed while keeping cutting tools cool with the Wesco pump unit. The pumps are recommended for most machines requiring a coolant, such as drill presses, lathes, grinders, saws, and abrasive belts.

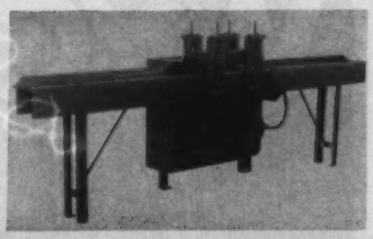
You can purchase units with 5, 12, and 40 gallon containers. Motors are available from 1/20 to ½ hp.

For further information, *write* Wesco Tool & Mfg. Inc., 2820 San Fernando Blvd., Burbank, Calif.

High Speed Saw Has Variable Speed Blade

EQUIPPED with a multiple cutting head, a high speed saw makes up to nine slices simultaneously in such materials as carbon bars. Blade speeds can be varied to suit specific cutting operations. The saw will handle stock 2¼ in. thick x 10¼ in. wide x 36 in. long. It is equipped with power feed for production cutting, with powered rollers above and below the work.

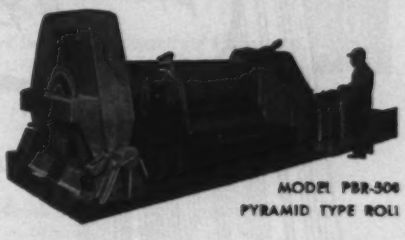
The saw has a 10 in. diameter circular blade and 5 hp drive motor. Top and rip fence are replaceable. Exhaust duct for a dust collector is included. The machine is 8 ft long,



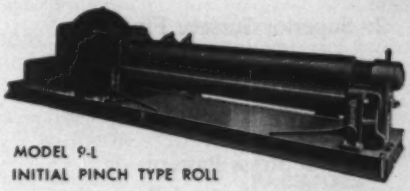
WEBB PLATE FABRICATING MACHINERY

PLATE BENDING ROLLS

The Webb Corporation offers a complete line of Plate Bending Rolls for the rolling of the thinnest plate up to plate 2½" thick. Offered in a variety of lengths and thicknesses. Constructed for the modern fabricating shop.



MODEL PBR-508
PYRAMID TYPE ROLL

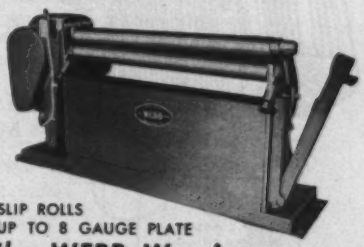


MODEL 9-L
INITIAL PINCH TYPE ROLL

Two types available: the Initial Pinch Type and Pyramid Type machines. All latest advantages of today's modern machine tools are incorporated, utilizing anti-friction bearings, totally enclosed gear drives. Special forming rolls for culvert pipe, stock tanks and other special shapes available.

SLIP ROLLS

A complete line of small Sheet Metal Forming Rolls are also available. All power-driven with shaft sizes 3" to 5" for the handling of the thinnest gauge material, up to 8 gauge material. Special rolls for the forming of polished sheets, aluminum and stainless steels can be furnished. Complete catalogues on any size machine furnished upon request; write Dept. D.



SLIP ROLLS
UP TO 8 GAUGE PLATE

Let Speed PAY—The WEBB Way!

SLIP ROLLS

PYRAMID TYPE ROLL

INITIAL TYPE ROLL

STEELWORKERS

Also Manufacturers of INDUSTRIAL WEIGHING EQUIPMENT

Since 1881 THE WEBB CORP.
WEBB CITY, MO., U. S. A.

Your assurance for:

1. Straightness
2. Superior Surface Finish
3. True Tolerance
4. Uniform Machinability
5. Ideal Stress Patterns or other Physical Properties
6. Service that Satisfies

You will save Time, Metal and Money when you specify *Wyckoff* Steels.

OUR CONSTANT RESEARCH PROGRAM IS YOUR BEST GUARANTEE OF QUALITY CONTROL

WYCKOFF STEEL PRODUCTS • Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All types of Furnace Treated Steels including Carbon Corrected Steels

SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY

WYCKOFF STEEL COMPANY

GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
Branch Offices in Principal Cities
Works: Ambridge, Pa.
Chicago, Ill., Newark, N.J.—Putnam, Conn.

NEW PRODUCTS and equipment

4 ft high, and 30 in. wide.

For further information, *write* W. F. Wells & Sons, Three Rivers, Mich.

Synthetic Rubber Sealant Resists Deterioration

SOLUTIONS to many joint-sealing and glazing problems are to be found in a mastic based on Du Pont's Hypalon synthetic rubber (chlorosulfonated polyethylene). Field trials have shown it overcomes joint closure problems due to sunlight, ozone, water, strong oxidizing chemicals, heat, abrasion, and movement.

The material bonds tightly to most engineering and structural materials and self-cures to a resilient rubber seal. It can serve as a cure-in-place gasket for equipment such as pumps, piping, ductwork, and housings. The company says it withstands most rubber-deteriorating liquids and atmospheres, dampens vibration, and reduces noise. It retains rubberlike qualities from −40 to 250° F.

For further information, *write* Grayguard Inc., P. O. Box 1644, Wilmington 99, Del.

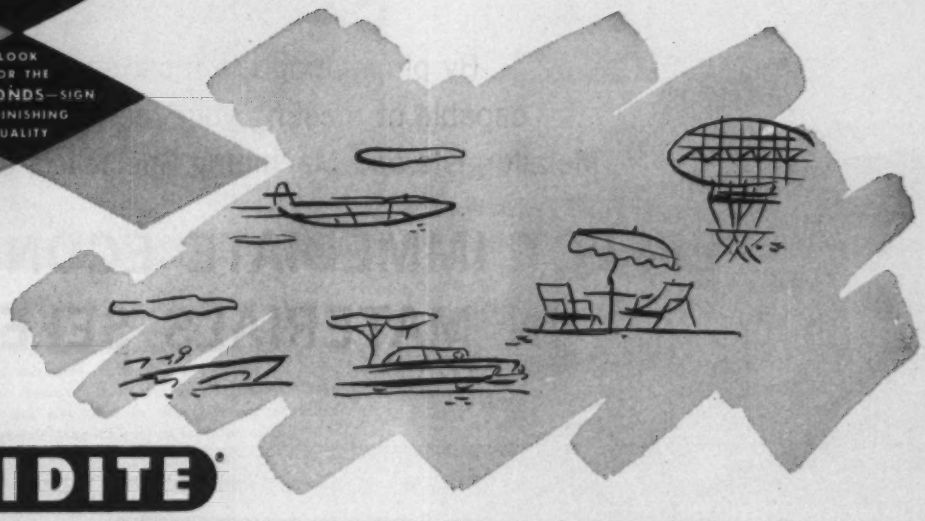
Zinc Plating Brighteners Are Supplied as Liquids

TWO brightening agents for zinc plating have been developed by Allied Research Products Inc. Both are stable liquids that provide effective brightening even after weekend shutdowns. The material will tolerate wide variations in the zinc bath formula.

Isobrite No. 354 produces a white, bright plate directly from the barrel even without bright dipping. Isobrite No. 355 produces a bright zinc deposit with a slight yellow cast from barrels, or rack plating tanks. Its fine grain, uniform deposit produces a plate with clarity and sparkle after bright dipping.

For further information, *write* Allied Research Products Inc., 4004 E. Monument St., Baltimore 5, Md.

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY



Only IRIDITE®

Process Engineered Chromate Conversion Coatings

Give you 5 additional benefits for Corrosion Protection—Paint Base—Decorative Finishing

1 A COMPLETE PROCESS ENGINEERED LINE

Developed for specific applications, there is an Iridite to provide the finish you desire, fit the equipment you have available and give the performance you require. Most Iridite coatings meet rigid military and civilian specifications.

2 EXPERIENCED TECHNICAL SERVICE

Our large field engineering staff is thoroughly familiar with chromate conversion coatings and related finishing operations. They'll help you check every step in your finishing operation to make sure you're getting the best possible finish on your products.

3 PRODUCT AVAILABILITY

Warehouses located in strategic industrial areas enable us to provide you with fast, economical delivery on any Iridite.

4 ECONOMY

The superior performance of Iridite provides low final cost by extending operating life and lowering maintenance costs. In addition, Iridite gives you a finish that adds considerably to the value of your product. There's an Iridite to meet every cost and performance requirement.

5 RESEARCH AND DEVELOPMENT FACILITIES

If you have an unusual application, we will gladly work with you. Our entire staff of experienced engineers and chemists, and our completely equipped facilities are at your service.

IRIDITE—a specialized line of chromate conversion coatings for non-ferrous metals. Apply by dip, brush or spray methods — at room temperature — manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. No special equipment, exhaust systems or specially trained personnel required.

If you are using chromate conversion coatings to finish zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze — consider the above benefits of Iridite. For complete information, contact your Allied Field Engineer. He's listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILE.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers Equipment, and Supplies for Metal Finishing

IRIDITE® Chromate Coatings	IRILAC™ Clear Coatings	ISOBRITE® Plating Brighteners	ARP® Chemicals & Supplies	WAGNER Line of Equipment

By pinpointing the most economical material capable of meeting your requirements, Republic Metallurgists and Machining Specialists can help you

EFFECT IMMEDIATE ECONOMIES IN MATERIALS SELECTION

CENTURY SERIES C-1144 Distributor Shaft

CENTURY SERIES C-1141 Hoist Support Shaft

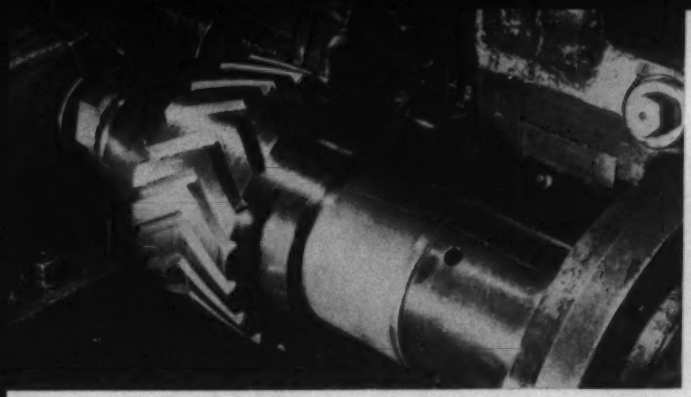
CENTURY SERIES C-1151 Electric Motor Shaft

CENTURY SERIES C-1050 Axle

CENTURY SERIES C-1045 Shaft

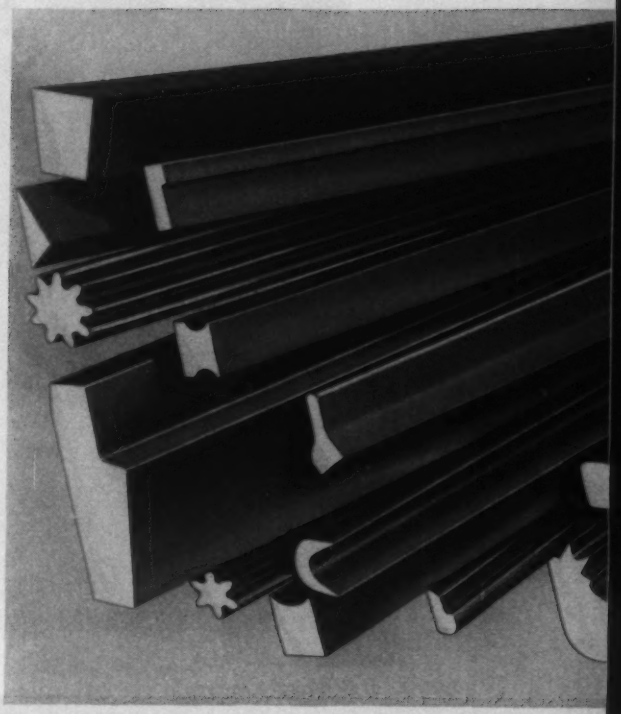
GRADE	ANALYSIS EXTRA	BEST COMBINATION OF STRENGTH & TOUGHNESS	MACHINABILITY
C-1144	$1.35		
C-1141	1.10		
C-1151	.70		
C-1050	.15		
C-1045	.15		

TO SAVE TIME AND MONEY in steel parts production, select from Republic's CENTURY SERIES of high strength, stress-relieved, cold finished steel bars. With varying degrees of machinability (as seen in the chart), each of the five grades provides a minimum yield strength of 100,000 psi. Better strength/toughness ratios are frequently obtained by selecting one of the less expensive, lower sulphur steels.



FOR ADDED MACHINABILITY, consider Republic Cold Drawn Leaded Alloy Steels. Leading producers of gears use Republic Leaded Alloy Steel in the production of heavy-duty herringbone gears. The addition of lead increases machinability as much as 25%. Heat treating assures adequate hardness and toughness. These cost-reducing alloys are available in almost every standard analysis and many specials. Mail the coupon for information.

TO REPLACE COSTLY ASSEMBLIES WITH ONE PIECE SHAPES, select Republic Cold Drawn Special Sections formed to the predominating cross section of the part. Eliminating or greatly reducing machining, Republic Special Sections permit faster output at lower unit cost. Completed parts are stronger and longer wearing because cold drawing improves the mechanical properties of any given analysis. Available in carbon, alloy, and stainless steels. Mail coupon for data.



CENTURY SERIES BOOKLET

Want more facts? This free booklet provides the basic facts you need to determine where Republic's CENTURY SERIES may help you save time and money. Simply return the coupon.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. ST -8691
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

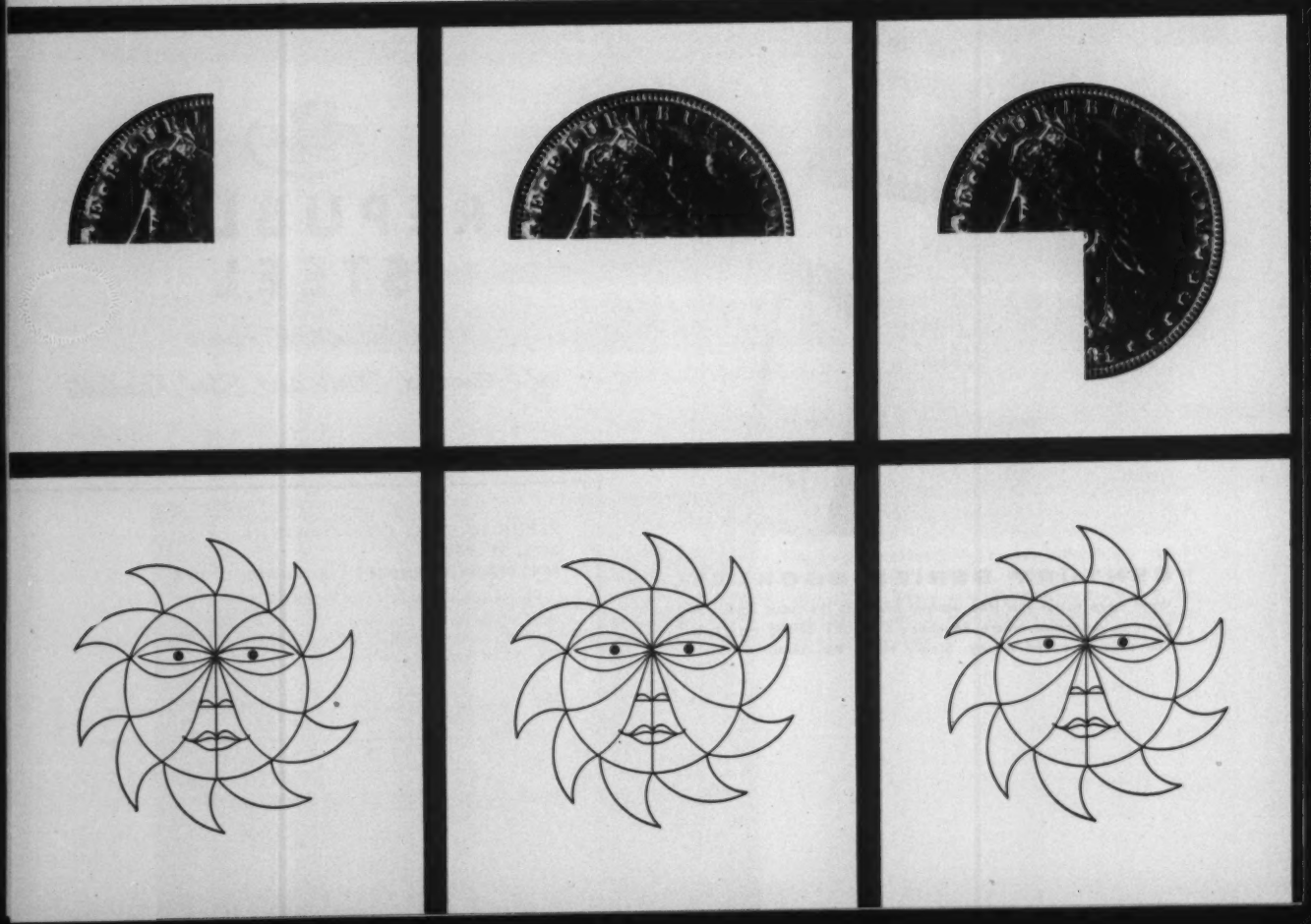
☐ Please send free CENTURY SERIES Booklet
Send more information on:
☐ Cold Finished Leaded Alloy Steel
☐ Cold Drawn Special Sections

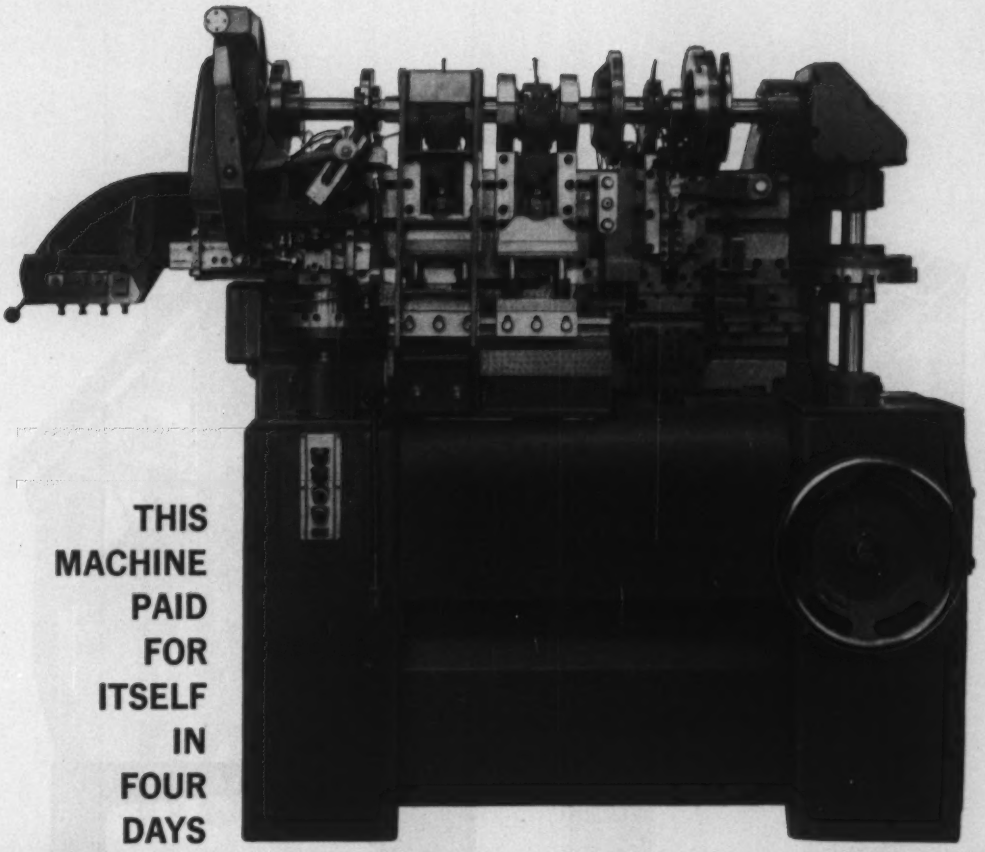
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

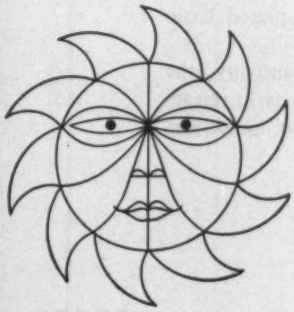


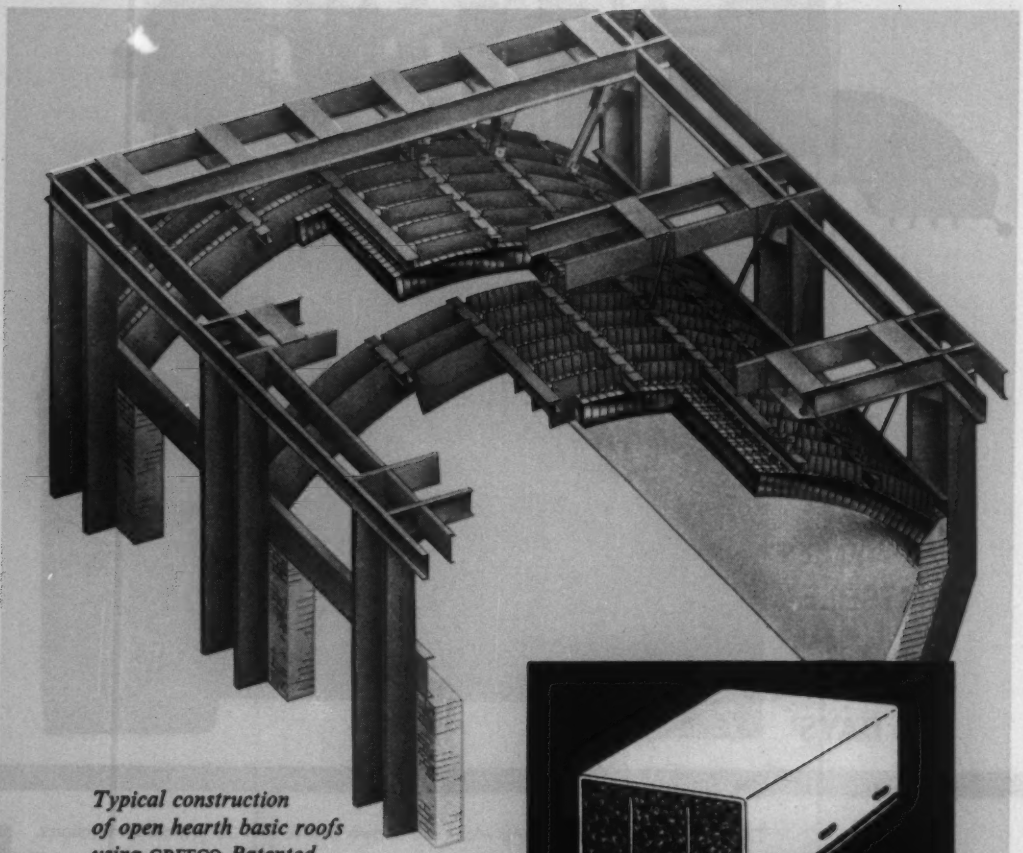


THIS MACHINE PAID FOR ITSELF IN FOUR DAYS

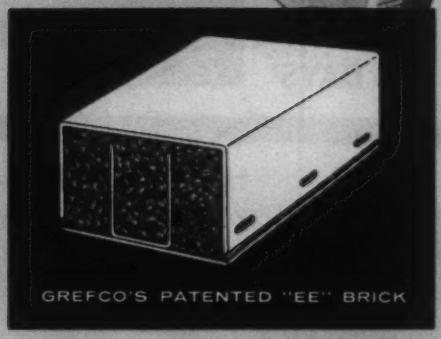
The high-precision enameling wiper die shown below, has 26 critical dimensions. Previous production methods at the General Electric Industrial Heating Department employed either 5 or 6 standard OBI presses. Today, General Electric is producing this part **FOUR TIMES AS FAST—USING ONLY ONE TORRINGTON V-82 VERTI-SLIDE—AND SAVING $13,500 ON A SINGLE PRODUCTION RUN TOTALING 3 DAYS OF OPERATION.** This amazing new vertical four-slide machine promises a genuine revolution in high-speed, high-precision, low-cost production of just about everything in strip or wire that is now produced on progressively tooled forming presses or horizontal four-slide machines. Write or call today for complete technical data—or a Torrington sales engineer.

THE TORRINGTON MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO





Typical construction of open hearth basic roofs using GREFCO *Patented "EE" brick with and without Patented "TAB" suspension.*



GREFCO'S PATENTED "EE" BRICK

• Many open hearth shops and numerous individual furnaces have repeatedly broken daily, weekly and monthly tonnage records this year.

This all-out production destroys steel furnace refractories, particularly roofs. But furnace roofs of "EE" basic refractory brick—with steel plates imbedded within them—provide long furnace campaigns despite the high temperatures and other refractory-destroying conditions brought on by high production rates. Basic roofs are becoming standard for open hearth furnaces; over 25% of all American open hearth steel is currently produced under internally plated basic brick.

General Refractories Company, the world's largest supplier of basic refractories, pioneered with steel producers

GREFCO "ALL-BASIC" FURNACE ROOFS LEAD TO PEAK STEEL PRODUCTION

GENERAL REFRACTORIES

here and abroad in developing the "All-Basic" furnace roof. GREFCO's patented internally plated brick were developed especially for roof service. Over 90% of all American open hearth furnace basic roofs now use brick of this type. They are also gaining rapid acceptance in Europe.

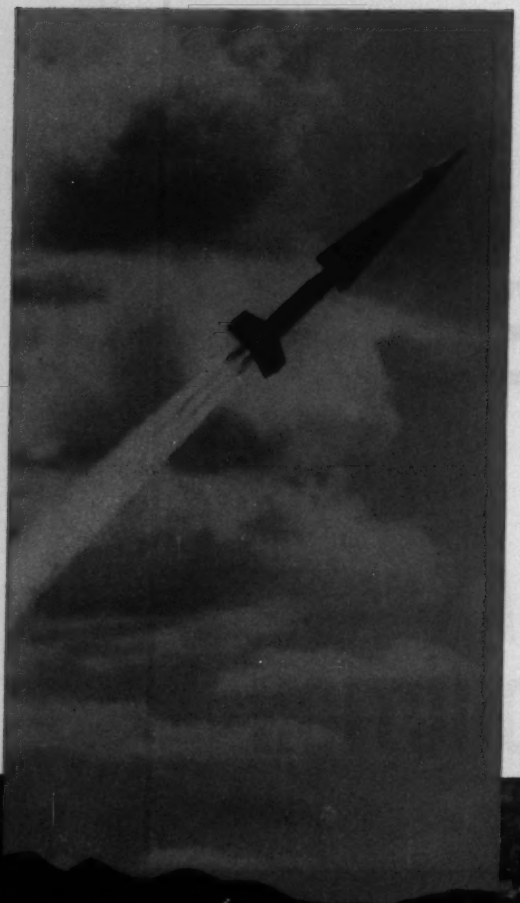
Justifiably proud of this contribution to basic steel-making, GREFCO remains the world's predominant supplier of open hearth basic roof brick. With alert understanding of customer needs, diligent research and aggressive management, GREFCO will continue to lead in basic refractories.

GENERAL REFRACTORIES CO.
PHILADELPHIA 2, PA.

Acme-Newport Steel

LEAVES ITS OLD KENTUCKY HOME

Destination: SPACE!

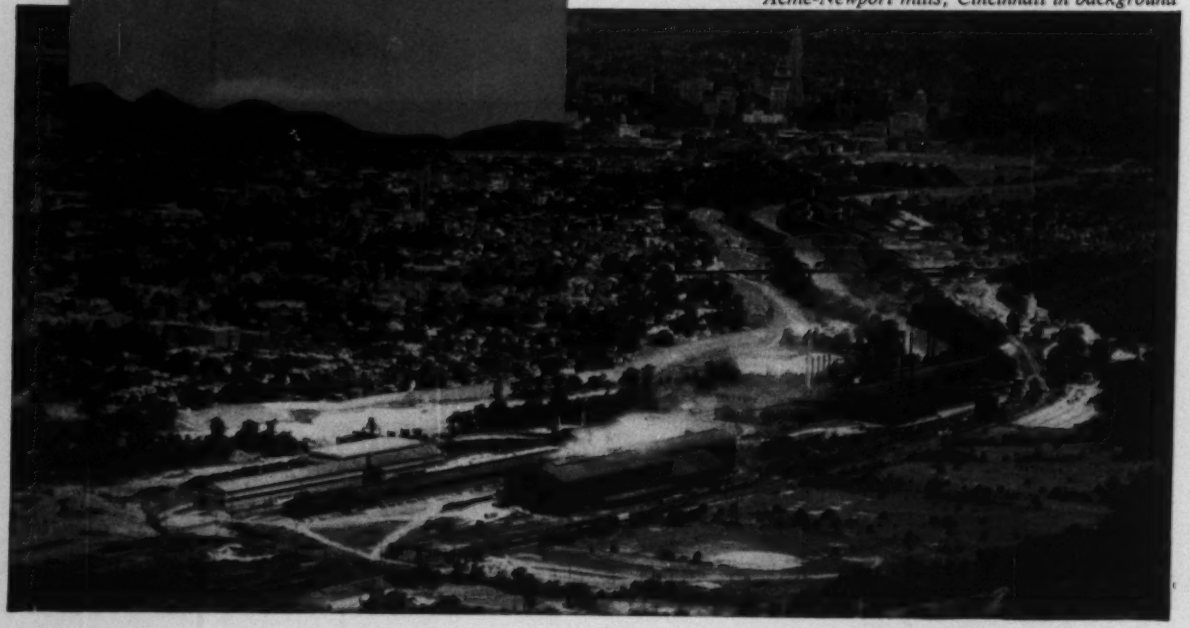


Carefully processed from electric furnace to finished steel, Acme-Newport products take off by fast truck or air freight on their second move toward space. Next stop: prime and subcontractors who continuously employ the long experience, skills and modern facilities of Acme-Newport in the cause of national survival. Alloy and carbon grades in strip, sheet and coil, become components of rockets, missiles, planes and ground support equipment, which permit nothing but perfect performance. Through three-quarters of a century we have supplied quality steel for arms and industry . . . for both of which we ask you to make our facilities your own.

Acme-Newport Steel COMPANY

NEWPORT, KENTUCKY

A SUBSIDIARY OF ACME STEEL COMPANY



Acme-Newport mills; Cincinnati in background

Steel Use Climbing to New Peak

STEEL CONSUMPTION will reach an all-time high of 85 million tons this year—surpassing the 83 million tons used in 1957. Seasonally adjusted, first quarter consumption will be at the highest rate in history. Fabricators will use 21 million tons of metal. They'll need 22 million tons in the second quarter, 21 million in the third, and 21 million in the fourth.

Answering the unprecedented demand, steelmakers will pour more ingots and ship more finished products than ever before. Barring a lengthy renewal of the strike, you can expect:

Record production of 130 million ingot tons (vs. 93.3 million last year and 117 million in 1955, the industry's top year). Record shipments of at least 93 million tons (vs. 67 million last year, 84.7 million in 1955).

SPOTLIGHT ON SHEETS—Look for steelmakers to operate their furnaces at an average rate of 95 per cent of capacity during the first half. They'll pour about 70 million ingot tons and ship about 51 million tons of finished steel to customers. You can expect record shipments of sheets (hot rolled, cold rolled, and galvanized), hot rolled bars, tin plate, and stainless steel.

WATCH INVENTORIES—Prospects for continued high production and shipments in the second half—and especially the fourth quarter—depend in part on consumer inventory policies. Market analysts wonder whether users will stop building when they get to 20 million tons (about the right size for the expected level of business activity) or carry accumulation too far, as they've done so often in the past. If they add 15 million tons to their present stockpiles (5 million in the second half), they'll need industry shipments of 98 million tons. Steelmakers' exuberance would be tempered by fears of a fourth quarter slowdown in incoming orders. Reason: If inventories reach 25 million tons, they'll be close to the all-time high and ripe for liquidation.

PRICES MAY RISE—Although they're anxious to hold the line, steelmakers wonder whether they'll be able to do it. C. M. White, Republic Steel Corp.'s chairman, estimates that the industry's "last" offer to the union (30.6 cents an hour in wages and fringes over three years) will increase costs by $5 a ton each year of the contract unless there are offsetting improvements in efficiency. "We cannot put ourselves in the position of saying that we are not going to raise prices," he warns.

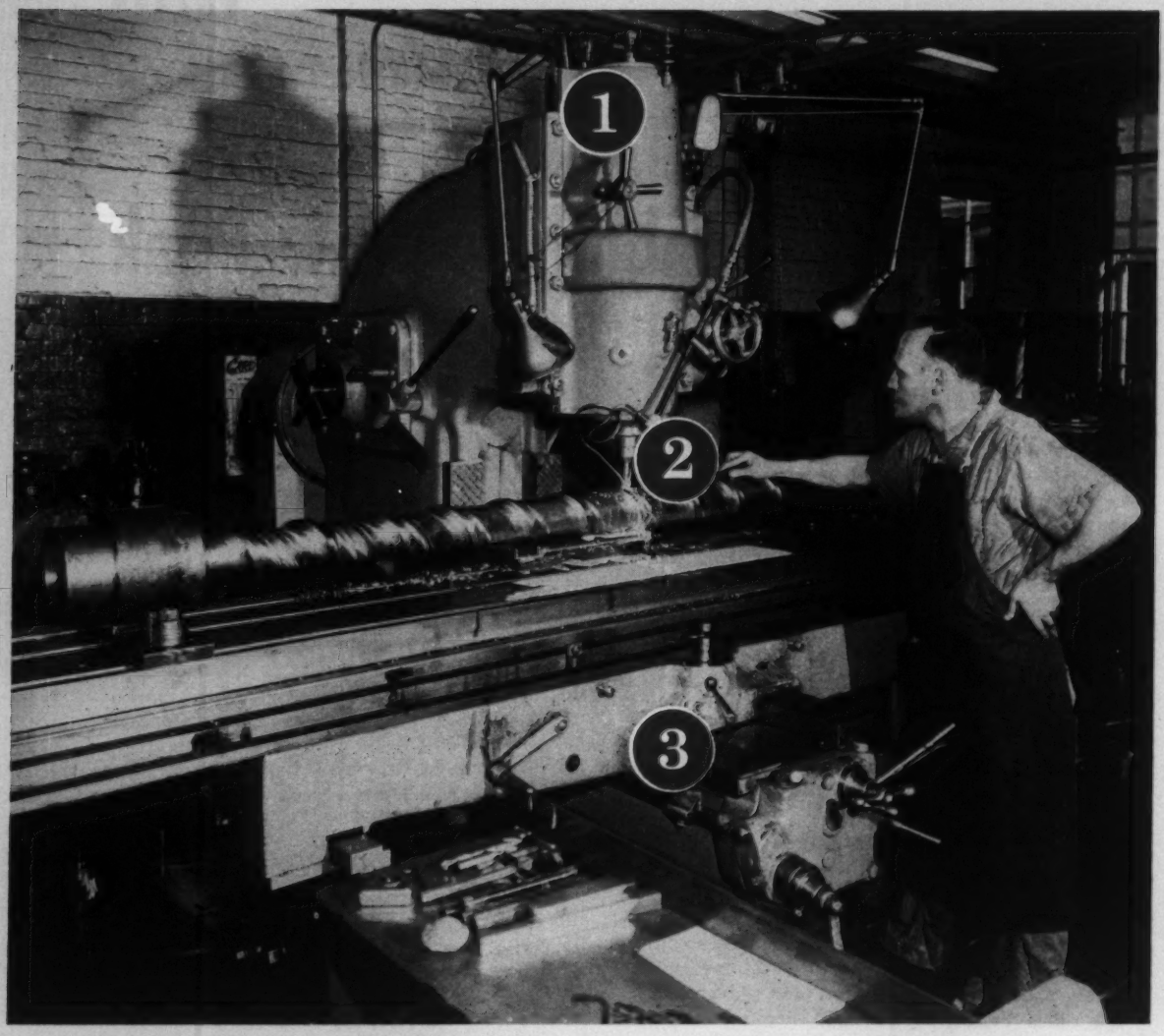
IMPORTS WILL FALL—Last year's record imports of finished steel products (about 4 million tons) resulted largely from strike-imposed scarcities in the U. S. Even though steel consumption will be greater than ever this year, imports will probably decline to about 3.5 million tons. Reasons: 1. European markets will absorb more of the home production. 2. Steel exported from Europe and Japan will probably be aimed at markets other than the U. S. (such as South America), where it can command higher prices. Look for U. S. steel exports of about 3 million tons (vs. 1.65 million last year).

PRODUCTION REBOUNDS—Although New Year's Day operations were somewhat curtailed, the ingot rate climbed 1.9 points last week to 95 per cent of capacity. Production was about 2,690,000 ingot tons.

WHERE TO FIND MARKETS & PRICES

	News	Prices
Bars, Merchant	382	388
Reinforcing	381	389
Boiler Tubes	...	391
Canada	...	*
Clad Steel	...	392
Coke	...	396
Coal Chemicals	...	396
Charts:		
Finished Steel	...	387
Ingot Rate	386	...
Scrap Prices	...	401
Comparisons	...	387
Contracts Placed	399	...
Contracts Pend.	399	...
Electrodes	...	396
Fasteners	...	391
Ferroalloys	...	398
Fluorspar	...	396
Footnotes	...	391
Imported Steel	...	396
Ingot Rates	386	...
Metal Powder	...	396
Nonferrous Met.	404	406
Ores	385	396
Pig Iron	386	394
Piling	...	388
Plates	384	388
Plating Material	...	407
Prestressed Strand	...	391
Price Indexes	...	387
Producers' Key	389	...
R.R. Materials	386	391
Refractories	...	396
Scrap	401	402
Semifinished	386	388
Service Centers	385	394
Sheets	382	389
Silicon Steel	...	390
Stainless Steel	...	392
Strip	382	390
Structurals	386	388
Tin Mill Prod.	384	390
Tool Steel	...	392
Tubular Goods	382	392
Wire	382	390

*Current prices were published in the Dec. 28 issue and will appear in subsequent issues.



IMPROVING FEEDS AND FINISHES... WITH ESSO LUBES

1. NEBULA® EP GREASE helps bearings run true longer . . . maintains precision running of plain and anti-friction bearings. Exceptional for its stable consistency, oxidation resistance and load-carrying ability throughout a wide temperature range.

2. KUTWELL® EP 66 CUTTING OIL speeds fine finishes . . . increases tool life; permits higher speeds and deeper cuts. Leaves an easy-to-see film for highly efficient lubrication. Contains a bactericide to keep emulsions sweet smelling and serviceable for longer periods.

3. FEBIS® K LUBRICANTS insure smooth-sliding ways . . . boost precision by eliminating "stick-slip" movement. These lubes actually make static friction less than sliding friction; easily pass the stick-slip test.

There's a complete line of specialized Esso Lubricants to help improve your operations. Contact your local Esso office or write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

Esso

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

STEEL
QUARTERLY SURVEY

COMPONENTS	CURRENT INVENTORIES: UNDER 10 DAYS	10-30 DAYS	30-60 DAYS	60-90 DAYS	3-6 MONTHS	1st Quarter FORECAST: LOWER	SAME	HIGHER
CASTINGS . . . . . Die, gray iron, malleable, nonferrous, steel.	2%	21%	53%	20%	4%	7%	70%	23%
OTHER FORMED COMPONENTS . . . . Forgings, stampings, springs, wire shapes.	2%	16%	51%	21%	10%	11%	58%	31%
MACHINED COMPONENTS . . . . . Bearings, couplings, cylinders, gears, screw machine products.	3%	18%	46%	24%	9%	11%	73%	16%
ELECTRICAL EQUIPMENT, MOTORS . .	13%	26%	39%	16%	6%	3%	80%	17%
FASTENERS	—	18%	49%	20%	13%	12%	67%	21%
MECHANICAL RUBBER GOODS, BELTING	6%	17%	51%	21%	5%	5%	83%	12%

FIGURES are percentages of respondents to STEEL's quarterly survey.
COLOR UNDERSCORED figures show how most respondents reported.

Imbalances Mar Component Stocks

Although the general inventory picture shows 76 per cent of reserves are good for 30 days or more, 80 per cent of the purchasing agents report imbalances

COMPONENT BUYERS will spend the first quarter plugging the holes in their inventories. Although 76 per cent have stocks good for a month or more, more than 80 per cent of STEEL's quarterly survey respondents reveal some inventory imbalances. If the steelworkers stay on the job, it will take an average of three months to erase the inequities. The extremes are two weeks to six months.

• **Going Up**—Over-all, most respondents are in better shape than they expected to be at this time. Only 18 per cent report stocks are lower, while 34 per cent indicate they're higher. Reserves appear to be settling at the 30 to 60 day level.

Buying for late winter and spring business has begun. More than 21 per cent of the purchasing agents surveyed see their stocks increasing by Apr. 1. About 71 per cent think they'll be the same, and 8 per cent expect a decrease.

During the fourth quarter, there were some inventory shifts. Stocks of electrical equipment, for example, dropped from October levels. Manufacturers operated at full clip throughout the steel walkout and are now running out of materials. Supplies of rubber goods are also down. Stockpiles built up for the duration of the rubber strike have been eaten away. An upturn in fasteners was recorded, indicating buyers have had somewhat more success in replenishing reserves since the mills have been back in operation than have some other purchasers.

• **Delivery Problems**—Over 47 per cent of STEEL's respondents voiced complaints about deliveries, the high for 1959. Stampings got the most mentions. Bearings were second, with electrical equipment and motors high on the list. In the first three quarters, respondents said bearings were their No. 1 delivery problem.

Less than 10 per cent of the purchasing agents are overstocked. Screw machine products were most frequently mentioned as in surplus. Castings were also noted.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 389

Shipments of billet steel concrete reinforcing bars in 1959 are estimated at 1.9 million tons. Imports are estimated at around 800,000 tons.

First quarter demand for bars is

expected to be heavy since it will be stimulated by builders turning to concrete construction during a period of tight structural steel supply. Bridge requirements for rebars are reported increasing.

Wire . . .

Wire Prices, Pages 390 & 391

Drawn wire production is higher, but only to the extent wire rod supplies are available. In some cases, output would be heavier if semifinished steel tonnage were more plentiful. That's the case especially with converters. Producers of wire rods and manufacturers wire are promising three months delivery on new orders and two months on nails and bale ties. Most merchant wire products, however, are available for fairly nearby shipment.

Demand for manufacturers wire is strong. Furniture makers in the Midwest are getting ready for the big January showing at Chicago. Automotive requirements are again at peak.

Drawn wire shipments last year were estimated at 2.7 million net tons, substantially in excess of the rod tonnage. That indicates heavy stocks of semifinished steel were accumulated prior to the steel strike.

Steel Bars . . .

Bar Prices, Page 388

Handicapped by a slow resumption of operations in November, hot rolled bar producers admit they've not made much headway toward clearing up their backlogs of third quarter, 1959, orders. Even though most of the mills are running at capacity, it's unlikely that shipments will be current with schedules before midyear.

Because they have had trouble breaking in new equipment and getting as much semifinished steel as they want, hot bar producers won't ship as much steel during the first quarter as they expected. They are trying to distribute the available tonnage as equitably as possible, though the historical buying pattern generally governs shipments.

Users have shown little interest in placing orders for the third quarter. Producers haven't opened their books for that period and probably won't before next month.

Even though the hot mills have been warning their customers that first quarter shipments will fall short of expectations, a leading Pittsburgh cold finisher anticipates no trouble maintaining two - shift operations. Deliveries of cold finished bars are far extended in many cases, reflecting the scarcity of hot stock. Some cold drawers can accept nothing in the way of new orders on either carbon or alloy grades, before May and June, particularly where they have to rely on hot bar shipments to turn out orders. Some shops can do better, but they are exceptions.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 389 & 390

Sheet sales offices were under a little less pressure for deliveries over the holidays. But a few of the larger consumers continued to turn on the heat for faster shipments, fearing resumption of the strike. Most users, though, realize the mills are doing their best to meet commitments and that no amount of pressure will change the situation.

Cold rolled sheet suppliers say few customers are complaining about the way tonnage is being distributed. For all practical purposes, the sheetmakers are sold out through June, though all of the tonnage to be produced in the first half hasn't been formally entered on order books. The mills, however, know pretty well where most of the tonnage will go, especially in the case of long term accounts.

Because their inventories are low and unbalanced, users will take everything they can get. However, once urgent requirements are satisfied and uninterrupted steel production is assured, it's thought some users may scale down their second quarter commitments, or at least ask that deliveries be extended over a longer period than originally stated.

Cold rolled and galvanized still head the list of critically needed items. Leading producers say they can't take any additional cold rolled tonnages for the first half, and all suppliers are allocating shipments on the basis of past buying patterns. They aren't booking anything for third quarter shipment. In galvanized sheets, however, some makers think they may get current with backed up orders by the end of February.

The automotive and appliance industries are so anxious for tonnage they are accepting small amounts of "surplus primes" (material not up to prime specifications). Normally, this class of sheet and strip moves to secondary distributors and special customers. Today it constitutes a sort of windfall for users of prime tonnage because it's not counted against regular customer quotas.

Tubular Goods . . .

Tubular Goods Prices, Page 392

When Eastern producers of oil country goods set up distributors in-transit stocks, they thought the system would allow them to compete more effectively with Texas and Colorado mills.

Here's how it worked: When a distributor shipped from his stock, he told his mill supplier where the pipe went. If he had to equalize freight with the nearest producer, the mill rebated any costs that were in excess of 4 per cent of the value of the steel shipped. In-transit stocks mushroomed all over the map, and the Eastern mills soon found that they were competing with each other's yards, not with rival producers in Texas and Colorado.

Tubemakers are now withdrawing their in-transit agreements with the distributors. They'll maintain their own in-transit stocks and assume sole responsibility for freight equalization.

They are also tightening credit to distributors, reverting from 120 day terms to "regular" terms, 2 per cent, 40 days. Sellers will continue to get a 6 per cent discount on mill prices.

Working 20 turns a week, a leading producers of oil country goods expects to ship all orders that were originally scheduled for the third quarter of last year by Feb. 15. Although the mill is booked into April and May on many items (mainly alloy tubing), it can still accept a few orders for first quarter delivery of small diameter carbon tubing and casing. That's something of a paradox because at most mills such material (2⅜ and 2⅞ in. tubing and 4½ in. casing) is harder to get than anything else.

Tubemakers are channeling almost all their output to the major oil companies and distributors. They're making only token ship-

YOUR LODGE-ical CHOICE for PRODUCTION

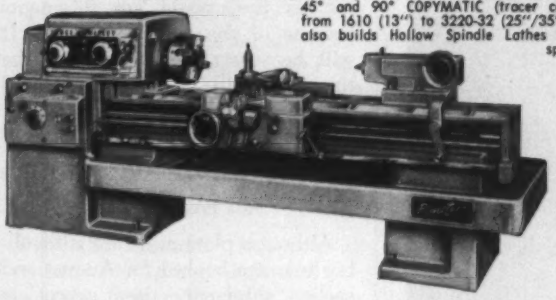
Lodge & Shipley LATHES • SHEARS • BRAKES

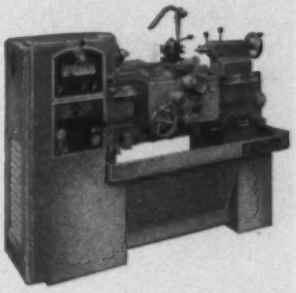
for low-cost, dependable service

Lodge & Shipley equipment represents almost 100 years of experience in the design and manufacture of heavy metal working machinery . . . offers you the most advanced features for fast, accurate and versatile operation. Lodge & Shipley equipment is precision engineered, ruggedly constructed and honestly rated to give trouble-free, low-cost production.

LATHES

Lodge & Shipley POWERTURN Lathes combine accuracy and rugged strength with greater precision and operating convenience. Fast, foolproof Speed Dial headstock has just two dials for fast setting of speed changes. POWERSHIFT PRESELECTOR Lathes are even faster; single dial for preselection of cutting speeds plus remote shift. Available in Engine, Toolmaker, Gap, 45° and 90° COPYMATIC (tracer controlled) Lathes in sizes from 1610 (13") to 3220-32 (25"/35" Raised). Lodge & Shipley also builds Hollow Spindle Lathes (with large hole through spindle) and 60" T Lathes.

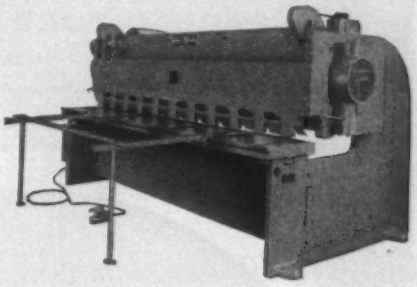


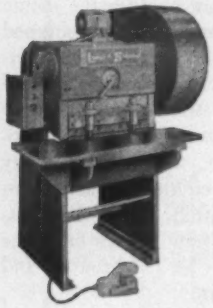


The Lodge & Shipley 1307 HI-TURN (10") Lathe is completely new in size, design, utility and even in its low price. It provides high speed turning, boring and facing capacity where the use of a leadscrew is of no consequence. The HI-TURN Lathe is extremely rugged and has nine geared speeds with a high spindle speed of 3000 rpm and 5 hp, giving the ability to handle newer, tougher metals at production rates. Also available with 45° hydraulic tracer slide and completely automatic cycling.

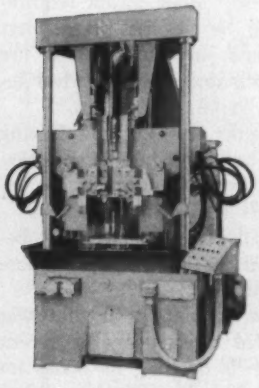
SHEARS

Featuring exclusive combination air clutch and brake which eliminates unnecessary gear wear, gives absolute overload protection, cushions shock. Many other features included in low base price. Capacities from 3/16" x 4' to 5/8" x 8'.



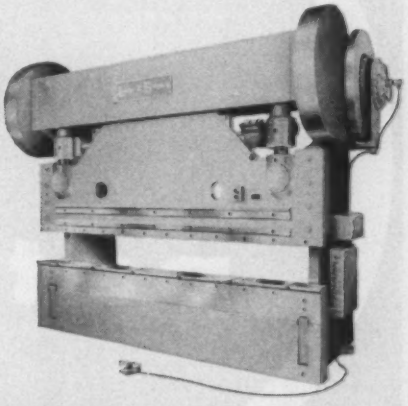


24" SPEED SHEAR . . . designed for accurate duplication of straight side parts without the expense of dies and punch press equipment. Production-proved for straight and angle shearing, slitting, notching, blanking and similar operations at speeds of 120 strokes per minute. Capacity: 10 gauge x 24" mild steel.



BRAKES

Rugged, powerful, heavy duty brakes with many features as standard. Specially-designed combination air clutch and brake installed in heavy, balanced flywheel requires no adjustment . . . known for trouble-free service. Available in capacities from 120 tons x 6' to 250 tons x 16'.



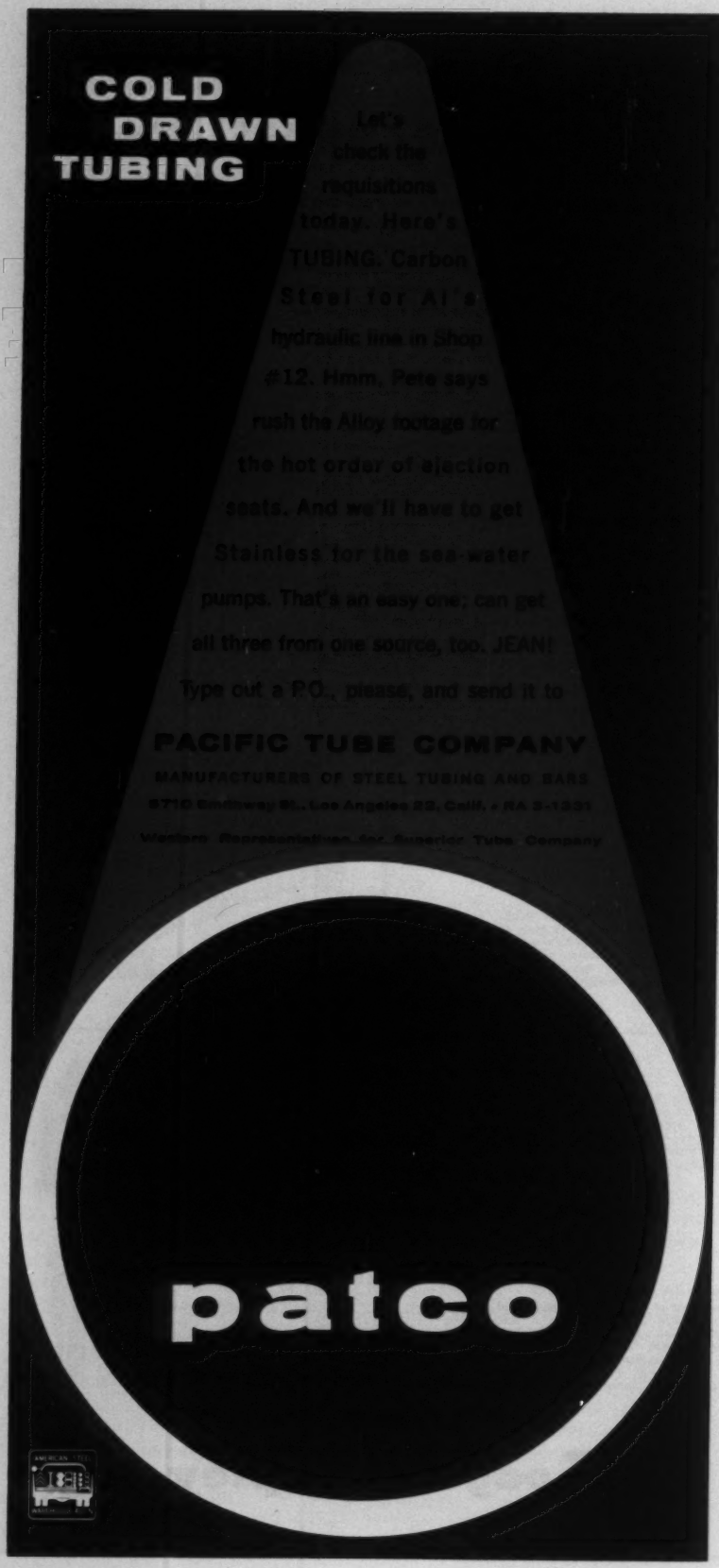
FLOTURN

Completely new metal forming equipment and process originated by Lodge & Shipley . . . saves time, material and tooling cost. Makes spherical, conical and cylindrical shapes from simple blanks. Replaces many costly forging, drawing and machining operations. No. 12 Vertical Floturn illustrated; larger sizes and sub-contract service also available.

Detailed Literature on Request

THE **Lodge & Shipley** COMPANY

3070 Colerain Avenue **Cincinnati 25, Ohio**



ments to their own badly depleted in-transit stocks. Chances are they won't replace the downriver inventories until sometime in second quarter. They are reluctant to ship to Kansas City now because shipments have to go by rail, which costs $6.50 a ton more than by barge.

Tin Plate . . .

Tin Plate Prices, Page 390

With tin plate being produced at close to full capacity in recent weeks, canmakers have been taking the material into their plants as fast as they could get shipments because of the labor situation. It will be several months before the tin mills will be able to rebuild their inventories.

Plates . . .

Plate Prices, Page 388

Although plate mills are still rolling tonnage booked for August and earlier shipment, they expect to clean up their third quarter backlog by the end of March. Some September tonnage will be shipped this month and more in February.

Sheared plate mills are behind schedule more than others because of construction and repair work started before the strike. They won't finish their third quarter tonnage until March. Still, it's possible to place new orders on some of the mills for February and March shipment.

Generally, the mills are expected to open their order books for second quarter soon. Plate girder requirements will be heavier in the first quarter, and structural shops are placing estimated needs with less delay after booking new jobs.

Weldment shops are having trouble rebuilding their inventories, except in those instances where defense needs are involved.

Universal plate tonnage now being booked will be shipped in late first quarter.

An eastern plate mill that was not affected directly by the recent steel strike is opening its books for second quarter business. Prospects are it may have to blank out tonnage in the first month of the period. Certain other mills have already booked some second quarter orders and could accept more. Pres-

sure in plates is not as strong as in sheets, tin plate, bars, and wide flange structurals.

Distributors . . .

Prices, Page 394

Steel service centers anticipate larger bookings this month. The improvement depends on the outcome of negotiations for a new steel labor contract. As fast as mill receipts come in, centers are shipping to customers, eliminating the possibility of accumulating stocks of the popular items.

Demand for sheet products continues strong. Plates (especially light) and structurals are moving rapidly through distribution channels. Orders for those items are not being booked for delivery much beyond the end of the first quarter.

Fair supplies of bars are reported in most districts, although not all sizes and grades are readily available.

At the moment, steel service centers are taking their full allocations from mills, but the situation may not hold for long. If the labor trouble is settled without another work stoppage, the service centers will tailor their intake to match sales and inventory requirements.

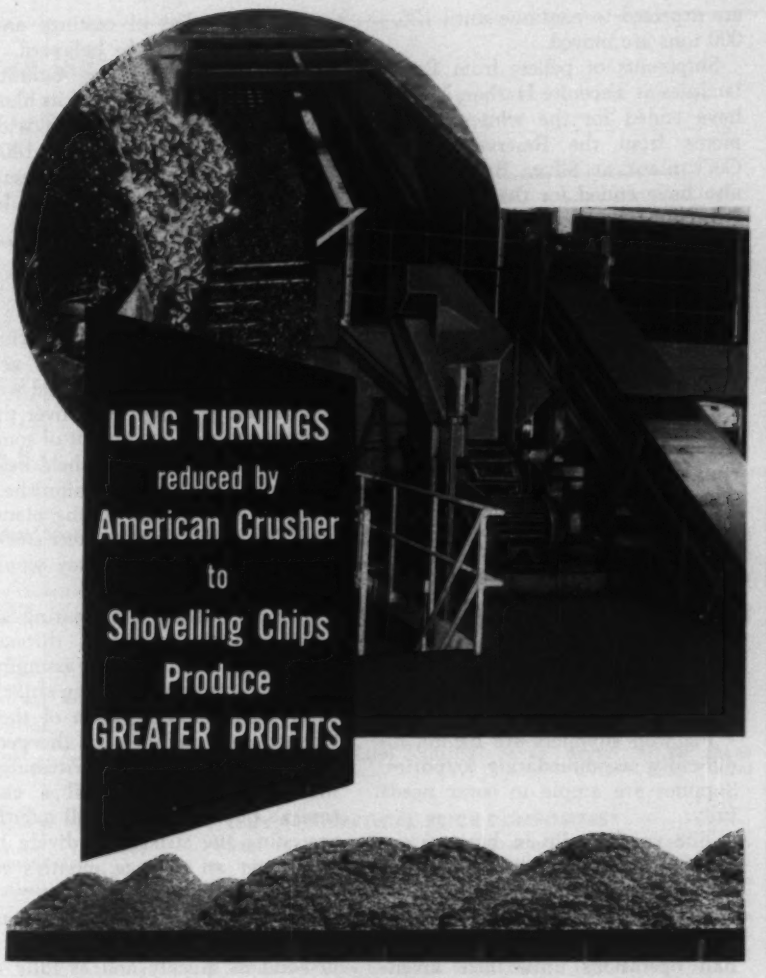
Iron Ore . . .

Iron Ore Prices, Page 396

Railroad shipments of foreign iron ore, stockpiled along the Eastern Seaboard and at Great Lakes ports, are being moved to inland furnaces. Bethlehem Steel's Lackawanna plant at Buffalo is reported taking in about 3000 tons a day. Mills in the Valley (Youngstown) are depending on foreign supplies to make up some of the deficit resulting from the strike-shortened lake shipping season.

Generally, steelmakers think ore supplies will be sufficient to tide them over until the opening of the 1960 lake navigation season. Some rail shipments of certain grades may be necessary through the winter to maintain balanced stocks.

Rail shipments of taconite pellets from northern Minnesota to Chicago are underway. Erie Mining Co. operates a taconite plant at Hoyt Lakes, Minn. Pellets are moving at a rate of 15 cars a day (each car carries about 50 tons). Shipments



American Metal Turnings Crusher

. . . increases profits . . . improves handling

An almost fully automatic chip salvage system, with an American Metal Turnings Crusher at its heart has increased profits, saved space, and improved housekeeping at a ball bearing plant, conveyors service two rows of automatic screw machines and feed a cross-over conveyor. The cross-over conveyor feeds turnings directly into an American Metal Turnings Crusher which reduces the turnings to uniform sized chips. From the crusher chips are conveyed to a hopper to be periodically discharged into a chip-wringer to reclaim cutting oil. Dry chips drop into a discharge hopper and feed into an air duct which pneumatically conveys the chips to a storage bin at the rail siding.

Literature on American Metal Turnings Crushers is yours for the asking.

American PULVERIZER COMPANY

ORIGINATORS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS

1539 MACKLIND AVE. ST. LOUIS 10, MO.

are expected to continue until 125,000 tons are moved.

Shipments of pellets from Erie's facilities at Taconite Harbor, Minn., have ended for the winter. Shipments from the Reserve Mining Co.'s plant at Silver Bay, Minn., also have ended for the season.

Inland Steel Co.'s giant new ore carrier, the *Edward L. Ryerson*, will be launched Jan. 21, at the yards of Manitowoc Shipbuilding Inc., Manitowoc, Wis. The vessel is the largest and most powerful built for the Great Lakes ore trade. When loaded to capacity, it will carry 27,000 gross tons, but capacity loading must await the deepening of connecting channels of the lakes. The Great Lakes ore cargo record is 22,379 tons.

The new ship bears the name of Edward L. Ryerson, former chairman of Inland Steel and of Joseph T. Ryerson & Son Inc., Chicago.

Pig Iron . . .

Pig Iron Prices, Page 394

Pig iron suppliers are having no difficulty accommodating foundries. Supplies are ample to cover needs fully.

The yearend dip in business experienced by gray iron foundries was steeper than usual due to the shortage of steel. Many users of castings were forced to curtail or halt operations until their inventories of steel components are replenished.

Many jobbing foundries take a dim view of business prospects for the next three months. Business should pick up in the second quarter when supplies of castings and steel are expected to be balanced.

Granite City Steel Co., Granite City, Ill., will cut out one of its blast furnaces Mar. 1 to replace it with one having a daily capacity of 1800 tons, double that of the present stack. The new furnace will be constructed off site.

Semifinished Steel . . .

Semifinished Prices, Page 388

With steel consumers clamoring for all the tonnage they can get, production of semifinished steel was maintained at a high level over the holiday period. The output of some finished products is being held back by the shortage of semifinished. Actually, some metalworking plants haven't enough finished steel stocks to operate at the level they would like.

The steelmakers are figuring on near capacity operations through the first half of the year (assuming there's no resumption of the strike). They have allocated most of their finished steel tonnage for the period. For example, one Pittsburgh mill's practice is to total a customer's purchases in the 40 months preceding the strike and divide by 40 to get an average month's requirements.

The high level steel ingot rate reflects steelmakers' efforts to meet demand as quickly and as fully as possible. Steel is flowing steadily from the mills, but consumers will need a lot more than they are getting before they'll be able to start rebuilding depleted stockpiles.

On the West Coast, Kaiser's oxygen steelmaking furnaces at Fontana, Calif., are producing steel in heats 70 per cent above design capacity. Each of the company's three oxygen furnaces was initially expected to handle 65 ton heats. Today, production is said to be consistently in heats greater than 110 tons.

Rails, Cars . . .

Track Material Prices, Page 391

Continued lag in freight car buying is reflected in the November statistics. Orders during the month totaled 2624 units vs. 2722 in October, and 6295 in November, 1958, reports the American Railway Car Institute and the Association of American Railroads.

Deliveries, however, were up slightly, numbering 2191 cars compared with 2147 in October, and 1842 in November last year.

Backlogs as of Dec. 1 were 36,555, of which 18,198 were on order in railroad shops and 18,357 in commercial shops. This is up slightly from 36,199 cars on Nov. 1 and is substantially higher than the 27,962 cars in backlogs on Dec. 1, 1958.

Structural Shapes . . .

Structural Shape Prices, Page 388

Reflecting seasonal influences, structural steel awards are slow. Fabricators' operations are still hampered by the shortage of steel, though they are getting more tonnage than they had expected a few weeks back. Still, it's not enough for them to catch up with backed up work.

(*Please turn to Page* 399)

DISTRICT INGOT RATES

(Percentage of capacity engaged)

	Week Ended Jan. 3	Change	Same Week 1959	Same Week 1958
Pittsburgh	96.5	+ 1	72	51
Chicago	96	0	88.5	67.5
Eastern	96	+ 4	71	80
Youngstown	99	0	64	48
Wheeling	95	+ 1	79	54.5
Cleveland	98	+ 3	83	57.5
Buffalo	107.5	0	66	56
Birmingham	89.5	0	73	71.5
Cincinnati	90	— 1	83	65
St. Louis	91.5	0	99.5	74
Detroit	102	+ 5.5*	94	73.5
Western	93.5	+ 4.5	79.5	77
National Rate	95	+ 1.9*	76.2	58.6

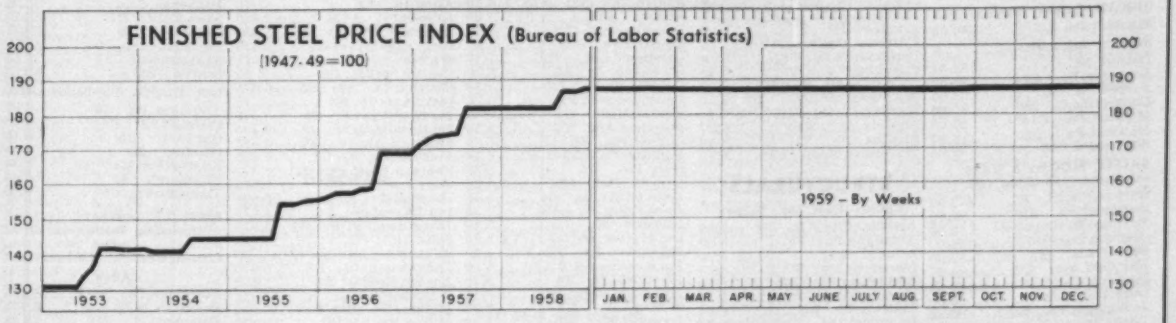
INGOT PRODUCTION

	Week Ended Jan. 3	Week Ago	Month Ago	Year Ago
INDEX (1947-49=100)	167.5†	164.1‡	165.0	128.1
NET TONS (In thousands)	2,690†	2,636‡	2,650	2,058

*Change from preceding week's revised rate.
†Estimated by STEEL; comparative figures reported by AISI. ‡Preliminary.
Weekly capacity (net tons): 2,831,331 in 1959 and 1960; 2,699,173 in 1958.

NATIONAL STEELWORKS OPERATIONS

Price Indexes and Composites



Dec. 29, 1959	Week Ago	Month Ago	Dec. Index	Year Ago
186.8	186.8	186.8	186.8	186.9

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Dec. 29

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard No. 1	$5.825	Bars, Reinforcing	6.385
Rails, Light, 40 lb	7.292	Bars, C.F., Carbon	10.710
Tie Plates	6.875	Bars, C.F., Alloy	14.125
Axles, Railway	10.175	Bars, C.F., Stainless, 302 (lb)	0.570
Wheels, Freight Car, 33 in. (per wheel)	62.000	Sheets, H.R., Carbon	6.350
Plates, Carbon	6.350	Sheets, C.R., Carbon	7.300
Structural Shapes	6.167	Sheets, Galvanized	8.765
Bars, Tool Steel, Carbon (lb)	0.560	Sheets, C.R., Stainless, 302 (lb)	0.658
Bars, Tool Steel, Alloy, Oil Hardening Die (lb)	0.680	Sheets, Electrical	12.625
Bars, Tool Steel, H.R. Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.060 (lb)	1.400	Strip, C.R., Carbon	9.489
Bars, Tool Steel, H.R. Alloy, High Speed, W18, Cr 4, V 1 (lb)	1.895	Strip, C.R., Stainless, 430 (lb)	0.480
Bars, H.R., Alloy	10.775	Strip, H.R., Carbon	6.250
Bars, H.R., Stainless, 303 (lb)	0.543	Pipe, Black, Buttweld (100 ft)	19.905
Bars, H.R., Carbon	6.675	Pipe, Galv., Buttweld (100 ft)	23.585
		Pipe, Line (100 ft)	199.533
		Casing, Oil Well, Carbon (100 ft)	201.080
		Casing, Oil Well, Alloy (100 ft)	315.213
Tubes, Boiler (100 ft)	51.200	Black Plate, Canmaking Quality (95 lb base box)	7.900
Tubing, Mechanical, Carbon (100 ft)	27.005	Wire, Drawn, Carbon	10.575
Tubing, Mechanical, Stainless, 304 (100 ft)	205.608	Wire, Drawn, Stainless, 430 (lb)	0.665
Tin Plate, Hot-dipped, 1.25 lb (95 lb base box)	10.100	Bale Ties (bundles)	7.967
Tin Plate, Electrolytic, 0.25 lb (95 lb base box)	8.800	Nails, Wire, 8d Common	9.825
		Wire, Barbed (80-rod spool)	8.758
		Woven Wire Fence (20-rod roll)	21.793

STEEL's FINISHED PRICE INDEX*

	Dec. 30 1959	Week Ago	Month Ago	Year Ago	5 Yr Ago
Index (1935-39 avg=100)	247.82	247.82	247.82	247.82	194.53
Index in cents per lb	6.713	6.713	6.713	6.713	5.270

STEEL's ARITHMETICAL PRICE COMPOSITES*

Finished Steel, NT	$149.96	$149.96	$149.96	$149.96	$117.95
No. 2 Fdry, Pig Iron, GT	66.49	66.49	66.49	66.49	56.54
Basic Pig Iron, GT	65.99	65.99	65.99	65.99	56.04
Malleable Pig Iron, GT	67.27	67.27	67.27	67.27	57.27
Steelmaking Scrap, GT	41.33	41.33	42.67	39.67	32.83

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL

	Dec. 30 1959	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bars, H.R., Pittsburgh	5.675	5.675	5.675	5.675	4.30
Bars, H.R., Chicago	5.675	5.675	5.675	5.675	4.30
Bars, H.R., deld., Philadelphia	5.975	5.975	5.975	5.975	4.55
Bars, C.R., Pittsburgh	7.65*	7.65*	7.65*	7.65*	5.40
Shapes, Std., Pittsburgh	5.50	5.50	5.50	5.50	4.25
Shapes, Std., Chicago	5.50	5.50	5.50	5.50	4.25
Shapes, deld., Philadelphia	5.77	5.77	5.77	5.77	4.53
Plates, Pittsburgh	5.30	5.30	5.30	5.30	4.225
Plates, Chicago	5.30	5.30	5.30	5.30	4.225
Plates, Coatesville, Pa.	5.30	5.30	5.30	5.30	4.225
Plates, Sparrows Point, Md.	5.30	5.30	5.30	5.30	4.225
Plates, Claymont, Del.	5.30	5.30	5.30	5.30	4.225
Sheets, H.R., Pittsburgh	5.10	5.10	5.10	5.10	4.05
Sheets, H.R., Chicago	5.10	5.10	5.10	5.10	4.05
Sheets, C.R., Pittsburgh	6.275	6.275	6.275	6.275	4.95
Sheets, C.R., Chicago	6.275	6.275	6.275	6.275	4.95
Sheets, C.R., Detroit	6.275	6.275	6.275	6.275	5.10
Sheets, Galv., Pittsburgh	6.875	6.875	6.875	6.875	5.45
Strip, H.R., Pittsburgh	5.10	5.10	5.10	5.10	4.05
Strip, H.R., Chicago	5.10	5.10	5.10	5.10	4.05
Strip, C.R., Pittsburgh	7.425	7.425	7.425	7.425	5.75
Strip, C.R., Chicago	7.425	7.425	7.425	7.425	5.85
Strip, C.R., Detroit	7.425	7.425	7.425	7.425	5.90
Wire, Basic, Pittsburgh	8.00	8.00	8.00	8.00	5.75
Nails, Wire, Pittsburgh	8.95	8.95	8.95	8.95	6.85
Tin plate (1.50 lb) box, Pitts.	$10.65	$10.65	$10.65	$10.65	$9.05

*Including 0.35c for special quality.

SEMIFINISHED STEEL

Billets, forging, Pitts. (NT)	$99.50	$99.50	$99.50	$99.50	$73.00
Wire rods, ⅜-⅝" Pitts.	6.40	6.40	6.40	6.40	4.675

PIG IRON, Gross Ton

	Dec. 30 1959	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bessemer, Pittsburgh	$67.00	$67.00	$67.00	$67.00	$57.00
Basic, Valley	66.00	66.00	66.00	66.00	56.00
Basic, deld., Philadelphia	70.41	70.41	70.41	70.41	59.66
No. 2 Fdry, Neville Island, Pa.	66.50	66.50	66.50	66.50	56.50
No. 2 Fdry, Chicago	66.50	66.50	66.50	66.50	56.50
No. 2 Fdry, deld., Phila.	70.91	70.91	70.91	70.91	55.16
No. 2 Fdry, Birmingham	62.50	62.50	62.50	62.50	52.88
No. 2 Fdry (Birm.) deld., Cin.	70.20	70.20	70.20	70.20	60.58
Malleable, Valley	66.50	66.50	66.50	66.50	56.50
Malleable, Chicago	66.50	66.50	66.50	66.50	56.50
Ferromanganese, net ton†	245.00	245.00	245.00	245.00	190.00

†74-76% Mn, Duquesne, Pa.

SCRAP, Gross Ton (Including broker's commission)

No. 1 Heavy Melt, Pittsburgh	$41.50	$41.50	$40.50	$42.50	$32.50
No. 1 Heavy Melt, E. Pa.	42.00	42.00	45.00	34.00	32.00
No. 1 Heavy Melt, Chicago	40.50	40.50	42.50	42.50	34.00
No. 1 Heavy Melt, Valley	42.50	42.50	42.50	42.50	34.50
No. 1 Heavy Melt, Cleve.	40.50	40.50	40.50	39.00	32.50
No. 1 Heavy Melt, Buffalo	37.50	37.50	39.50	33.50	30.50
Rails, Rerolling, Chicago	61.50	61.50	64.50	62.50	53.00
No. 1 Cast, Chicago	54.50	54.50	56.50	45.50	40.00

COKE, Net Ton

Beehive, Furn., Connlsvl.	$15.00	$15.00	$15.00	$15.25	$13.75
Beehive, Fdry., Connlsvl.	18.25	18.25	18.25	18.25	16.75
Oven, Fdry., Milwaukee	32.00	32.00	32.00	30.50	25.25

Steel Prices

Mill prices as reported to STEEL, Dec. 30, cents per pound except as otherwise noted. *Changes shown in italics.* Code number following mill point indicates producing company. Key to producers page 389; footnotes, page 391.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall,Pa. U5 ....$76.00

INGOTS, Alloy (NT)

Detroit S41 ....$82.00
Economy,Pa. B14 ....82.00
Farrell,Pa. S3 ....82.00
Lowellville,O. S3 ....82.00
Midland,Pa. C18 ....82.00
Munhall,Pa. U5 ....82.00
Sharon,Pa. S3 ....82.00

BILLETS, BLOOMS & SLABS
Carbon, Rerolling (NT)

Bartonville,Ill. K4 ...$82.00
Bessemer,Pa. U5 ....80.00
Buffalo R2 ....80.00
Clairton,Pa. U5 ....80.00
Ensley,Ala. T2 ....80.00
Fairfield,Ala. T2 ....80.00
Fontana,Calif. K1 ....90.50
Gary,Ind. U5 ....80.00
Johnstown,Pa. B2 ....80.00
Lackawanna,N.Y. B2 ....80.00
Munhall,Pa. U5 ....80.00
Owensboro,Ky. G8 ....80.00
S.Chicago,Ill. R2, U5 ..80.00
S.Duquesne,Pa. U5 ..80.00
Sterling,Ill. N15 ....80.00
Youngstown R2 ....80.00

Carbon, Forging (NT)

Bessemer,Pa. U5 ....$99.50
Buffalo R2 ....99.50
Canton,O. R2 ....102.00
Clairton,Pa. U5 ....99.50
Conshohocken,Pa. A3 .104.50
Ensley,Ala. T2 ....99.50
Fairfield,Ala. T2 ....99.50
Farrell,Pa. S3 ....99.50
Fontana,Calif. K1 ...109.00
Gary,Ind. U5 ....99.50
Geneva, Utah C11 ....99.50
Houston S5 ....104.50
Johnstown,Pa. B2 ....99.50
Lackawanna,N.Y. B2..99.50
LosAngeles B3 ....109.00
Midland,Pa. C18 ....99.50
Munhall,Pa. U5 ....99.50
Owensboro,Ky. G8 ....99.50
Seattle B3 ....109.00
Sharon,Pa. S3 ....99.50
S.Chicago R2, U5, W14 99.50
S.Duquesne,Pa. U5 ...99.50
S.SanFrancisco B3 ...109.00
Warren,O C17 ....99.50

Alloy, Forging (NT)

Bethlehem,Pa. B2 ..$119.00
Bridgeport,Conn. C32 119.00
Buffalo R2 ....119.00
Canton,O. R2, T7 ....119.00
Conshohocken,Pa. A3..126.00
Detroit S41 ....119.00
Economy,Pa. B14 ....119.00
Farrell,Pa. S3 ....119.00
Fontana,Calif. K1 ...140.00
Gary,Ind. U5 ....119.00
Houston S5 ....124.00
Ind.Harbor,Ind. Y1 ..119.00
Johnstown,Pa. B2 ....119.00
Lackawanna,N.Y. B2..119.00
LosAngeles B3 ....139.00
Lowellville,O. S3 ....119.00
Massillon,O. R2 ....119.00
Midland,Pa. C18 ....119.00
Munhall,Pa. U5 ....119.00
Owensboro,Ky. G8 ....119.00
Sharon,Pa. S3 ....119.00
S.Chicago R2,U5,W14 119.00
S.Duquesne,Pa. U5 ..119.00
Struthers,O. Y1 ....119.00
Warren,O. C17 ....119.00

ROUNDS, SEAMLESS TUBE (NT)

Buffalo R2 ....$122.50
Canton,O. R2 ....125.00
Cleveland R2 ....122.50
Gary,Ind. U5 ....122.50
S.Chicago,Ill. R2, W14 122.50
S.Duquesne,Pa. U5 ..122.50
Warren,O. C17 ....122.50

SKELP

Aliquippa,Pa. J5 ....5.05
Munhall,Pa. U5 ....5.05
Pittsburgh J5 ....5.05
Warren,O. R2 ....5.05
Youngstown R2, U5 ....5.05

WIRE RODS

AlabamaCity, Ala. R2 ..6.40
Aliquippa,Pa. J5 ....6.40
Alton,Ill. L1 ....6.50
Bartonville,Ill. K4 ....6.50
Buffalo W12 ....6.40
Cleveland A7 ....6.40
Donora,Pa. A7 ....6.40
Fairfield,Ala. T2 ....6.40
Houston S5 ....6.65
IndianaHarbor,Ind. Y1..6.40
Johnstown,Pa. B2 ....6.40
Joliet,Ill. A7 ....6.40
KansasCity,Mo. S5 ....6.65
Kokomo,Ind. C16 ....6.50
LosAngeles B3 ....7.20
Minnequa,Colo. C10 ....6.65
Monessen,Pa. P7 ....6.40
Pittsburg,Calif. C11 ....7.20
Portsmouth,O. P12 ....6.40
Roebling,N.J. R5 ....6.50
S.Chicago,Ill. R2, W14..6.40
SparrowsPoint,Md. B2..6.50
Sterling,Ill.(1) N15 ....6.40
Sterling,Ill. N15 ....6.50
Struthers,O. Y1 ....6.40
Worcester,Mass. A7 ....6.70

STRUCTURALS

Carbon Steel Std. Shapes

AlabamaCity,Ala. R2 ..5.50
Aliquippa,Pa. J5 ....5.50
Atlanta A11 ....5.70
Bessemer,Ala. T2 ....5.50
Bethlehem,Pa. B2 ....5.55
Birmingham C15 ....5.50
Clairton,Pa. U5 ....5.50
Fairfield,Ala. T2 ....5.50
Fontana,Calif. K1 ....6.30
Gary,Ind. U5 ....5.50
Geneva,Utah C11 ....5.50
Houston S5 ....5.60
Ind.Harbor,Ind. I-2, Y1.5.50
Johnstown,Pa. B2 ....5.55
Joliet,Ill. P22 ....5.50
KansasCity,Mo. S5 ....5.60
Lackawanna,N.Y. B2 ..5.55
Los Angeles B3 ....6.20
Minnequa,Colo. C10 ....5.80
Munhall,Pa. U5 ....5.50
Niles,Calif. P1 ....6.25
Phoenixville,Pa. P4 ....5.55
Portland,Oreg. O4 ....6.25
Seattle B3 ....6.25
S.Chicago,Ill. U5, W14.5.50
S.SanFrancisco B3 ....6.15
Sterling,Ill. N15 ....5.50
Torrance,Calif. C11 ....6.20
Weirton,W.Va. W6 ....5.50

Wide Flange

Bethlehem Pa. B2 ....5.55
Clairton,Pa. U5 ....5.50
Fontana,Calif. K1 ....6.45
IndianaHarbor,Ind. I-2..5.50
Lackawanna,N.Y. B2 ..5.55
Munhall,Pa. U5 ....5.50
Phoenixville,Pa. P4 ....5.55
S.Chicago,Ill. U5 ....5.50
Sterling,Ill. N15 ....5.50
Weirton,W.Va. W16 ....5.50

Alloy Std. Shapes

Aliquippa,Pa. J5 ....6.80
Clairton,Pa. U5 ....6.80
Gary,Ind. U5 ....6.80
Houston S5 ....6.90
Munhall,Pa. U5 ....6.80
S.Chicago,Ill. U5, W14..6.80

H.S., L.A., Std. Shapes

Aliquippa Pa. J5 ....8.05
Bessemer,Ala. T2 ....8.05
Bethlehem,Pa. B2 ....8.10
Clairton,Pa. U5 ....8.05
Fairfield,Ala. T2 ....8.05
Fontana,Calif. K1 ....8.85
Gary,Ind. U5 ....8.05
Geneva,Utah C11 ....8.05
Houston S5 ....8.15
Ind.Harbor,Ind. I-2, Y1.8.05
Johnstown,Pa. B2 ....8.10
KansasCity,Mo. S5 ....8.15
Lackawanna,N.Y. B2 ..8.10
LosAngeles B3 ....8.75
Munhall,Pa. U5 ....8.05
Seattle B3 ....8.80
S.Chicago,Ill. U5, W14..8.05
S.SanFrancisco B3 ....8.70
Sterling Ill. N15 ....7.75
Struthers,O. Y1 ....8.05

H.S., L.A., Wide Flange

Bethlehem,Pa. B2 ....8.10
Ind.Harbor,Ind. I-2 ...8.05
Lackawanna,N.Y. B2 ..8.10
Munhall,Pa. U5 ....8.05
S.Chicago,Ill. U5 ....8.05
Sterling,Ill. N15 ....7.75

PILING

BEARING PILES

Bethlehem,Pa. B2 ....5.55
Ind.Harbor,Ind. I-2 ....5.50
Lackawanna,N.Y. B2 ..5.55
Munhall,Pa. U5 ....5.50
S.Chicago,Ill. I-2, U5 ..5.50

STEEL SHEET PILING

Ind.Harbor,Ind. I-2 ....6.50
Lackawanna,N.Y. B2 ..6.50
Munhall Pa. U5 ....6.50
S.Chicago Ill. I-2, U5 ..6.50
Weirton,W.Va. W6 ....6.50

PLATES

PLATES, Carbon Steel

AlabamaCity,Ala. R2 ..5.30
Aliquippa,Pa. J5 ....5.30
Ashland,Ky.(15) A10 ..5.30
Atlanta A11 ....5.30
Bessemer,Ala. T2 ....5.30
Clairton,Pa. U5 ....5.30
Claymont,Del. C22 ....5.30
Cleveland J5, R2 ....5.30
Coatesville,Pa. L7 ....5.30
Conshohocken,Pa. A3 ..5.30
Ecorse,Mich. G5 ....5.30
Fairfield,Ala. T2 ....5.30
Farrell,Pa. S3 ....5.30
Fontana,Calif.(30) K1 ..6.10
Gary,Ind. U5 ....5.30
Geneva,Utah C11 ....5.30
GraniteCity,Ill. G4 ....5.40
Harrisburg,Pa. P4 ....5.30
Houston S5 ....5.40
Ind Harbor,Ind. I-2, Y1.5.30
Johnstown,Pa. B2 ....5.30
Lackawanna,N.Y. B2 ..5.30
Mansfield,O. E6 ....5.30
Minnequa,Colo. C10 ....6.15
Munhall,Pa. U5 ....5.30
Newport,Ky. A2 ....5.30
Pittsburgh J5 ....5.30
Riverdale,Ill. A1 ....5.30
Seattle B3 ....6.20
Sharon,Pa. S3 ....5.30
S.Chicago,Ill. U5 W14..5.30
SparrowsPoint,Md. B2 ..5.30
Sterling,Ill. N15 ....5.30
Steubenville,O. W10 ....5.30
Warren O. R2 ....5.30
Youngstown U5, Y1 ....5.30
Youngstown(27) R2 ....5.30

PLATES, Carbon Abras. Resist.

Claymont,Del. C22 ....7.05
Fontana,Calif. K1 ....7.85
Geneva,Utah C11 ....7.05
Houston S5 ....7.15
Johnstown,Pa. B2 ....7.05
SparrowsPoint,Md. B2 ..7.05

PLATES, Wrought Iron

Economy,Pa. B14 ....13.55

PLATES, H.S., L.A.

Aliquippa,Pa. J5 ....7.95
Ashland,Ky. A10 ....7.95
Bessemer,Ala. T2 ....7.95
Clairton,Pa. U5 ....7.95
Claymont,Del. C22 ....7.95
Cleveland J5, R2 ....7.95
Coatesville,Pa. L7 ....7.95
Conshohocken,Pa. A3 ..7.95
Economy Pa. B14 ....7.95
Ecorse,Mich. G5 ....7.95
Fairfield,Ala. T2 ....7.95
Farrell,Pa. S3 ....7.95
Fontana,Calif.(30) K1 ..8.75
Gary,Ind. U5 ....7.95
Geneva,Utah C11 ....7.95
Houston S5 ....8.05
Ind.Harbor,Ind. I-2, Y1.7.95
Johnstown,Pa. B2 ....7.95
Munhall,Pa. U5 ....7.95
Pittsburgh J5 ....7.95
Seattle B3 ....8.85
Sharon Pa. S3 ....7.95
S.Chicago Ill. U5, W14..7.95
SparrowsPoint,Md. B2 ..7.95
Warren.O. R2 ....7.95
Youngstown U5, Y1 ....7.95

PLATES, Alloy

Aliquippa,Pa. J5 ....7.50
Claymont,Del. C22 ....7.50
Coatesville,Pa. L7 ....7.50
Economy Pa. B14 ....7.50
Farrell,Pa. S3 ....7.50
Fontana,Calif. K1 ....8.30
Gary,Ind. U5 ....7.50
Houston S5 ....7.60
Ind.Harbor,Ind. Y1 ....7.50
Johnstown,Pa. B2 ....7.50
Lowellville,O. S3 ....7.50
Munhall Pa. U5 ....7.50
Newport,Ky. A2 ....7.50
Pittsburgh J5 ....7.50
Seattle B3 ....8.40
Sharon,Pa. S3 ....7.50
S Chicago Ill. U5, W14..7.50
SparrowsPoint Md. B2 ..7.50
Youngstown Y1 ....7.50

FLOOR PLATES

Cleveland J5 ....6.375
Conshohocken,Pa. A3 ..6.375
Ind.Harbor,Ind. I-2 ..6.375
Munhall,Pa. U5 ....6.375
Pittsburgh J5 ....6.375
S.Chicago,Ill. U5 ....6.375

PLATES, Ingot Iron

Ashland c.l. (15) A10 ..5.55
Ashland l.c.l. (15) A10 .6.05
Cleveland c.l. R2 ....6.05
Warren,O. c.l. R2 ....6.05

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)

Ala.City,Ala.(9) R2 ..5.675
Aliquippa,Pa. (9) J5 ..5.675
Alton,Ill. L1 ....5.875
Atlanta(9) A11 ....5.875
Bessemer,Ala.(9) T2 ..5.675
Birmingham(9) C15 ..5.675
Buffalo(9) R2 ....5.675
Canton,O.(23) R2 ....6.15
Clairton Pa. (9) U5 ..5.675
Cleveland(9) R2 ....5.675
Ecorse,Mich.(9) G5 ..5.675
Emeryville,Calif. J7 ..6.425
Fairfield,Ala.(9) T2 ..5.675
Fairless,Pa.(9) U5 ....5.825
Fontana,Calif.(9) K1..6.375
Gary,Ind.(9) U5 ....5.675
Houston(9) S5 ....5.925
Ind.Harbor(9) I-2, Y1 5.675
Johnstown,Pa.(9) B2 .5.675
Joliet,Ill. P2 ....5.675
KansasCity,Mo.(9) S5..5.925
Lackawanna(9) B2 ....5.675
LosAngeles(9) B3 ....6.375
Massillon,O.(23) R2 ..6.15
Midland,Pa.(23) C18 ..6.025
Milton,Pa. M18 ....5.825
Minnequa,Colo. C10 ..6.125
Niles,Calif. P1 ....6.375
Owensboro,Ky.(9) G8 ..6.025
Pittsburg,Calif.(9) C11.6.375
Pittsburgh(9) J5 ....5.675
Portland,Oreg. O4 ....6.425
Riverdale,Ill.(9) A1 ..5.675
Seattle A24, B3, N14..6.425
S.Ch'c'go(9)R2,U5,W14 5.675
S.Duquesne,Pa.(9) U5..5.675
S.SanFran.,Calif.(9)B3 6.425
Sterling,Ill.(1)(9) N15..5.675
Sterling,Ill.(9) N15 ....5.775
Struthers,O.(9) Y1 ....5.675
Tonawanda,N.Y. B12 ..5.675
Torrance Calif.(9) C11 .6.375
Warren,O. C17 ....6.052
Youngstown(9) R2,U5..5.675

BARS, Hot-Rolled Alloy

Aliquippa,Pa. J5 ....6.725
Bethlehem,Pa. B2 ....6.725
Bridgeport,Conn. C32 ..6.80
Buffalo R2 ....6.725
Canton,O. R2, T7 ....6.725
Clairton,Pa. U5 ....6.275
Detroit S41 ....6.725
Economy,Pa. B14 ....6.725
Ecorse,Mich. G5 ....6.725
Fairless,Pa. U5 ....6.875
Farrell,Pa. S3 ....6.725
Fontana,Calif. K1 ....7.775
Gary Ind. U5 ....6.725
Houston S5 ....6.975
Ind.Harbor,Ind. I-2, Y1 6.725
Johnstown,Pa. B2 ....6.725
KansasCity,Mo. S5 ....6.975
Lackawanna,N.Y. B2 ..6.725
LosAngeles B3 ....7.775
Lowellville,O. S3 ....6.725
Massillon,O. R2 ....6.725
Midland,Pa. C18 ....6.725
Owensboro,Ky. G8 ....6.725
Pittsburgh J5 ....6.725
Sharon,Pa. S3 ....6.725
S.Chicago R2, U5, W14 6.725
S.Duquesne,Pa. U5 ....6.725
Struthers,O. Y1 ....6.725
Warren,O. C17 ....6.725
Youngstown U5 ....6.725

BARS & SMALL SHAPES, H.R. High-Strength, Low-Alloy

Aliquippa,Pa. J5 ....8.30
Bessemer,Ala. T2 ....8.30
Bethlehem,Pa. B2 ....8.30
Clairton,Pa. U5 ....8.30
Cleveland R2 ....8.30
Ecorse,Mich. G5 ....8.30
Fairfield,Ala. T2 ....8.30
Fontana,Calif. K1 ....9.00
Gary,Ind. U5 ....8.30
Houston S5 ....8.55
Ind.Harbor,Ind. Y1 ....8.30
Johnstown,Pa. B2 ....8.30
KansasCity,Mo. S5 ....8.55
Lackawanna,N.Y. B2 ..8.30
LosAngeles B3 ....9.00
Pittsburgh J5 ....8.30
Seattle B3 ....9.05
S.Chicago,Ill. R2, W14.8.30
S.Duquesne,Pa. U5 ....8.30
S.SanFrancisco B3 ....9.05
Struthers,O. Y1 ....8.30
Youngstown U5 ....8.30

BAR SIZE ANGLE; H.R. Carbon

Bethlehem Pa.(9) B2 ..5.825
Houston(9) S5 ....5.925
KansasCity,Mo.(9)S5 ..5.925
Lackawanna(9) B2 ....5.675
Sterling,Ill. N15 ....5.775
Sterling,Ill.(1) N15....5.675
Tonawanda,N.Y. B12 ..5.675

BAR SIZE ANGLES; S. Shapes

Aliquippa,Pa. J5 ....5.675
Atlanta A11 ....5.875
Joliet,Ill. P22 ....5.675
Minnequa,Colo. C10 ....6.125
Niles,Calif. P1 ....6.375
Pittsburgh J5 ....5.675
Portland,Oreg. O4 ....6.425
SanFrancisco S7 ....6.52
Seattle B3 ....6.425

BAR SHAPES, Hot-Rolled Alloy

Aliquippa,Pa. J5 ....6.80
Clairton,Pa. U5 ....6.80
Gary,Ind. U5 ....6.80
Houston S5 ....7.05
KansasCity,Mo. S5 ....7.05
Pittsburgh J5 ....6.80
Youngstown U5 ....6.80

BARS, C.F. Loaded (Including loaded extra)
Carbon

LosAngeles P2, S30 ..11.75*

Alloy

Ambridge,Pa. W18 ..10.175
BeaverFalls,Pa. M12..10.175
Camden,N.J. P13 ....10.35
Chicago W18 ....10.175
Elyria,O. W8 ....10.175
Monaca,Pa. S17 ....10.175
Newark,N.J. W18 ....10.35
SpringCity,Pa. K3 ....10.35

*Grade A; add 0.05c for Grade B.

BARS, Cold-Finished Carbon

Ambridge,Pa. W18 ....7.65
BeaverFalls,Pa. M12,R2 7.65
Birmingham C15 ....8.25
Buffalo B5 ....7.70
Camden,N.J. P13 ....8.10
Carnegie,Pa. C12 ....7.65
Chicago W18 ....7.65
Cleveland A7, C20 ....7.65
Detroit B5, P17 ....7.85
Detroit S41 ....7.65
Donora,Pa. A7 ....7.65
Elyria,O. W8 ....7.65
FranklinPark,Ill. N5 ....7.65
Gary,Ind. R2 ....7.65
GreenBay,Wis. F7 ....7.65
Hammond,Ind. J5, L2..7.65
Hartford,Conn. R2 ....8.15
Harvey,Ill. B5 ....7.65
LosAngeles(49) S30 ....9.10
LosAngeles(49) P2, R2 9.10
Mansfield,Mass. B5 ....8.20
Massillon,O. R2, R8 ....7.65
Midland Pa. C18 ....7.65
Monaca,Pa. S17 ....7.65
Newark,N.J. W18 ....8.10
NewCastle,Pa.(17) B4 ..7.55
Pittsburgh J5 ....7.65
Plymouth,Mich. P5 ....7.90
Putnam Conn. W18 ....8.20
Readville,Mass. C14 ....8.20
S.Chicago,Ill. W14 ....7.65
SpringCity,Pa. K3 ....8.10
Struthers,O. Y1 ....7.65
Warren.O. C17 ....7.65
Waukegan,Ill. A7 ....7.65
Willimantic,Conn. J5 ..8.15
Youngstown F3, Y1 ....7.65

BARS, Cold-Finished Carbon (Turned and Ground)

Cumberland,Md.(5) C19.6.55

BARS, Cold-Finished Alloy

Ambridge,Pa. W18 ....9.025
BeaverFalls Pa.M12,R2 9.025
Bethlehem,Pa. B2 ....9.025
Bridgeport,Conn. C32 ..9.175
Buffalo B5 ....9.025
Camden,N.J. P13 ....9.20
Canton,O. T7 ....9.025
Carnegie,Pa. C12 ....9.025
Chicago W18 ....9.025
Cleveland A7, C20 ....9.025
Detroit B5, P17 ....9.225
Detroit S41 ....9.025
Donora,Pa. A7 ....9.025
Elyria,O. W8 ....9.025
FranklinPark,Ill. N5 ..9.025
Gary,Ind. R2 ....9.025
GreenBay,Wis. F7 ....9.025
Hammond,Ind. J5, L2..9.025
Hartford,Conn. R2 ....9.325
Harvey Ill. R5 ....9.025
Lackawanna,N.Y. B2..9.025
LosAngeles P2, S30 ....11.00
Mansfield,Mass. B5 ....9.325
Massillon,O. R2, R8 ..9.025
Midland,Pa. C18 ....9.025
Monaca,Pa. S17 ....9.025
Newark,N.J. W18 ....9.20
Plymouth,Mich. P5 ....9.225
S.Chicago,Ill. W14 ....9.025
SpringCity,Pa. K3 ....9.20
Struthers,O. Y1 ....9.025
Warren,O. C17 ....9.025
Waukegan,Ill. A7 ....9.025
Willimantic,Conn. J5 ..9.325
Worcester Mass. A7 ..9.325
Youngstown F3, Y1 ..9.025

BARS, Reinforcing, Billet (To Fabricators)

AlabamaCity,Ala. R2 ..5.675
Atlanta A11 .....5.675
Birmingham C15 .....5.675
Buffalo R2 .....5.675
Cleveland R2 .....5.675
Ecorse,Mich. G5 .....5.675
Emeryville,Calif. J7 ...6.425
Fairfield,Ala. T2 .....5.675
Fairless,Pa. U5 .....5.825
Fontana,Calif. K1 ....6.375
Ft.Worth,Tex(4)(26)T4 5.925
Gary,Ind. U5 .....5.675
Houston S5 .....5.925
Ind.Harbor,Ind. I-2,Y1 5.675
Johnstown,Pa. B2 ....5.675
Joliet,Ill. P22 .....5.675
KansasCity,Mo. S5 ....5.925
Kokomo,Ind. C16 .....5.775
Lackawanna,N.Y. B2 ..5.675
LosAngeles B3 .....6.375
Madison,Ill. L1 .....5.875
Milton,Pa. M18 .....5.825
Minnequa,Colo. C10 ..6.125
Niles,Calif. P1 .....6.375
Pittsburg,Calif. C11 ..6.375
Pittsburgh J5 .....5.675
Portland,Oreg. O4 .....6.425
SandSprings,Okla. S5 ..5.925
Seattle A24, B3, N14 .6.425
S.Chicago,Ill. R2, W14.5.675
S.Duquesne,Pa. U5 ....5.675
S.SanFrancisco B3 ....6.425
SparrowsPoint,Md. B2..5.675
Sterling,Ill. (1) N15 ..5.675
Sterling,Ill. N15 .....5.775
Struthers,O. Y1 .....5.675
Tonawanda,N.Y. B12 ...6.10
Torrance,Calif. C11 ...6.375
Youngstown R2, U5 ..5.675

BARS, Reinforcing, Billet (Fabricated: To Consumers)

Baltimore B2 .....7.42
Boston B2, U8 .....8.15
Chicago U8 .....7.41
Cleveland U8 .....7.39
Houston S5 .....7.60
Johnstown,Pa. B2 .....7.33
KansasCity,Mo. S5 ....7.60
Lackawanna, N.Y. B2 ..7.35
Marion,O. P11 .....6.70
Newark,N.J. U8 .....7.80
Philadelphia U8 .....7.63
Pittsburgh J5, U8 .....7.35
SandSprings,Okla. S5 ...7.60
Seattle A24, B3, N14 ..7.95
SparrowsPt.,Md. B2 ...7.33
St.Paul U8 .....8.17
Williamsport,Pa. S19 ...7.25

BARS, Wrought Iron

Economy,Pa.(S.R.)B14 14.90
Economy,Pa.(D.R.)B14 18.55
Economy(Staybolt)B14 19.00
McK.Rks.(S.R.) L5 ...14.50
McK.Rks.(D.R.) L5 ...19.80
McK.Rks.(Staybolt)L5. 20.95

BARS,Rail Steel

ChicagoHts.(3) C2, I-2..5.575
ChicagoHts.(4)(44) I-2 5.675
ChicagoHts. (4) C2 ...5.675
Franklin,Pa. (3) F5 ..5.575
Franklin,Pa.(4) F5 ...5.675
JerseyShore,Pa.(3) J8 ..5.55
Marion,O. (3) P11 ....5.575
Tonawanda(3) B12 ....5.575
Tonawanda(4) B12 ....6.10

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

AlabamaCity,Ala. R2 ...5.10
Allenport,Pa. P7 .....5.10
Aliquippa,Pa. J5 .....5.10
Ashland,Ky.(8) A10 ...5.10
Cleveland J5, R2 .....5.10
Conshohocken,Pa. A3 ..5.15
Detroit(8) M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Fairless,Pa. U5 .....5.15
Farrell,Pa. S3 .....5.10
Fontana,Calif. K1 ....5.825
Gary,Ind. U5 .....5.10
Geneva,Utah C11 .....5.20
GraniteCity,Ill.(8) G4 ..5.20
Ind.Harbor,Ind. I-2, Y1.5.10
Irvin,Pa. U5 .....5.10
Lackawanna,N.Y. B2 ...5.10
Mansfield,O. E6 .....5.10
Munhall,Pa. U5 .....5.10
Newport,Ky. A2 .....5.10
Niles,O. M21, S3 .....5.10
Pittsburg,Calif. C11 ....5.80
Pittsburgh J5 .....5.10
Portsmouth,O. P12 .....5.10
Riverdale,Ill. A1 .....5.10
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. U5, W14 ..5.10
SparrowsPoint,Md. B2 ..5.10
Steubenville,O. W10 ....5.10
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5, Y1 ....5.10

SHEETS, H.R. (19 Ga. & Lighter)

Niles,O. M21, S3 .....6.275

SHEETS, H.R., Alloy

Gary,Ind. U5 .....8.40
Ind.Harbor,Ind. Y1 ....8.40
Irvin,Pa. U5 .....8.40
Munhall,Pa. U5 .....8.40
Newport,Ky. A2 .....8.40
Youngstown U5, Y1 ....8.40

SHEETS, H.R. (14 Ga. & Heavier) High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....7.525
Ashland,Ky. A10 .....7.525
Cleveland J5, R2 .....7.525
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 .....7.525
Fairfield,Ala. T2 .....7.525
Fairless,Pa. U5 .....7.575
Farrell,Pa. S3 .....7.525
Fontana,Calif. K1 .....8.25
Gary,Ind. U5 .....7.525
Ind.Harbor,Ind. I-2, Y1 7.525
Irvin,Pa. U5 .....7.525
Lackawanna(35) B2 ...7.525
Munhall,Pa. U5 .....7.525
Niles,O. S3 .....7.525
Pittsburgh J5 .....7.525
S.Chicago,Ill. U5, W14.7.525
Sharon,Pa. S3 .....7.525
SparrowsPoint(36) B2..7.525
Warren,O. R2 .....7.525
Weirton,W.Va. W6 ....7.525
Youngstown U5, Y1 ...7.525

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ....5.35
Cleveland R2 .....5.875
Warren,O. R2 .....5.875

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 .....7.05
Middletown,O. A10 ....6.775
Warren,O. R2 .....7.05

SHEETS, Cold-Rolled Steel (Commercial Quality)

AlabamaCity,Ala. R2 ..6.275
Aliquippa,Pa. J5 .....6.275
Allenport,Pa. P7 .....6.275
Cleveland J5, R2 .....6.275
Conshohocken,Pa. A3 ..6.325
Detroit M1 .....6.275
Ecorse,Mich. G5 .....6.275
Fairfield,Ala. T2 .....6.275
Fairless,Pa. U5 .....6.325
Follansbee,W.Va. F4 ..6.275
Fontana, Calif. K1 .....7.40
Gary,Ind. U5 .....6.275
GraniteCity,Ill. G4 ....6.375
Ind.Harbor,Ind. I-2, Y1 6.275
Irvin,Pa. U5 .....6.275
Lackawanna,N.Y. B2 ..6.275
Mansfield,O. E6 .....6.275
Middletown,O A10 ....6.275
Newport,Ky. A2 .....6.275
Pittsburg,Calif. C11 ....7.225
Pittsburgh J5 .....6.275
Portsmouth,O. P12 ....6.275
SparrowsPoint,Md. B2 ..6.275
Steubenville,O. W10 ....6.275
Warren,O. R2 .....6.275
Weirton,W.Va. W6 ....6.275
Yorkville,O. W10 .....6.275
Youngstown Y1 .....6.275

SHEETS, Cold-Rolled, High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....9.275
Cleveland J5, R2 .....9.275
Ecorse,Mich. G5 .....9.275
Fairless,Pa. U5 .....9.325
Fontana,Calif. K1 .....10.40
Gary,Ind. U5 .....9.275
Ind.Harbor,Ind. I-2, Y1 9.275
Lackawanna(37) B2 ..9.275
Pittsburgh J5 .....9.275
SparrowsPoint(38) B2..9.275
Warren,O. R2 .....9.275
Weirton,W.Va. W6 ....9.275
Youngstown Y1 .....9.275

SHEETS, Culvert	Cu Steel	Cu Fe
Ala.City,Ala. R2	7.225	....
Ashland,Ky. A10	7.225	7.475
Canton,O. R2	7.225	7.75
Fairfield,Ala. T2	7.225	7.475
Gary,Ind. U5	7.225	7.475
GraniteCity,Ill. G4	7.325	....
Ind.Harbor I-2	7.225	7.475
Irvin,Pa. U5	7.225	7.475
Kokomo,Ind. C16	7.325	....
MartinsFry. W10	7.225	7.475
Pitts.,Calif. C11	7.975	....
Pittsburgh J5	7.225	....
SparrowsPt. B2	7.225	....

SHEETS, Culvert—Pure Iron

Ind.Harbor,Ind. I-2 ....7.475

SHEETS, Galvanized Steel Hot-Dipped

AlabamaCity,Ala. R2 .6.875‡
Ashland,Ky. A10 .....6.875‡
Canton,O. R2 .....6.875‡
Dover,O. E6 .....6.875†
Fairfield,Ala. T2 .....6.875†
Gary,Ind. U5 .....6.875†
GraniteCity,Ill. G4 ...6.975*
Ind.Harbor,Ind. I-2 ..6.875†
Irvin,Pa. U5 .....6.875†
Kokomo,Ind. C-16 ....6.975‡
MartinsFerry,O. W10..6.875*
Middletown,O. A10 ..6.875†
Pittsburg,Calif. C11 ...7.625*
Pittsburgh J5 .....6.875†
SparrowsPt.,Md. B2 ..6.875†
Warren,O. R2 .....6.875†
Weirton,W.Va. W6 ...6.875*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1 ....7.325

SHEETS, Galvanized High-Strength, Low-Alloy

Irvin,Pa. U5 .....10.125
Pittsburgh J5 .....10.125
SparrowsPt.(39) B2 ..10.025

SHEETS, Galvannealed Steel

Canton,O. R2 .....7.275
Irvin,Pa. U5 .....7.275

SHEETS, Galvanized Ingot Iron (Hot-Dipped Continuous)

Ashland,Ky. A10 .....7.125
Middletown,O. A10 ....7.125

SHEETS, Electrogalvanized

Cleveland(28) R2 .....7.65
Niles,O.(28) R2 .....7.65
Weirton,W.Va. W6 .....7.50
Youngstown J5 .....7.50

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1) 9.525
Butler,Pa. A10 (type 2) 9.625

SHEETS, Enameling Iron

Ashland,Ky. A10 .....6.775
Cleveland R2 .....6.775
Fairfield,Ala. T2 .....6.775
Gary,Ind. U5 .....6.775
Ind.Harbor,Ind. I-2, Y1 6.775
Irvin,Pa. U5 .....6.775
Middletown,O. A10 ....6.775
Niles,O. M21, S3 .....6.775
Youngstown Y1 .....6.775

BLUED STOCK, 29 Gage

Dover,O. E6 .....8.70
Follansbee,W.Va. F4 ...8.70
Ind.Harbor,Ind. I-2 ....8.70
Mansfield,O. E6 .....8.70
Warren,O. R2 .....8.70
Yorkville,O. W10 .....8.70

SHEETS, Long Terne, Steel (Commercial Quality)

BeechBottom,W.Va.W10 7.225
Gary,Ind. U5 .....7.225
Mansfield,O. E6 .....7.225
Middletown,O. A10 ....7.225
Niles,O. M21, S3 .....7.225
Warren,O. R2 .....7.225
Weirton,W.Va. W6 ....7.225

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10 ....7.625

Key To Producers

A1 Acme Steel Co.
A2 Acme-Newport Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.
A24 Alaska Steel Mills Inc.

B1 Babcock & Wilcox
B2 Bethlehem Steel Co.
B3 Bethlehem Steel Co., Pacific Coast Div.
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div., Colo. Fuel & Iron
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div., Borg-Warner Corp.
C4 Carpenter Steel Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div., H. K. Porter Co., Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C22 Claymont Plant, Wickwire Spencer Steel Div., Colo. Fuel & Iron
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.
C32 Carpenter Steel of N.Eng.

D2 Detroit Steel Corp.
D4 Disston Div., H. K. Porter Co. Inc.
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas&Fuel Assoc.
E2 Eastern Stainless Steel
E5 Elliott Bros. Steel Co.
E6 Empire-Reeves Steel Corp.
E10 Enamel Prod. & Plating

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div., Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.
G8 Green River Steel Corp.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins Steel Tube Works
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L6 Lone Star Steel Co.
L7 Lukens Steel Co.
L8 Leschen Wire Rope Div., H. K. Porter Co. Inc.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M14 McInnes Steel Co.
M16 Md. Fine & Specialty Wire Co. Inc.
M17 Metal Forming Corp.
M18 Milton Steel Div. Merritt-Chapman&Scott
M21 Mallory-Sharon Metals Corp.
M22 Mill Strip Products Co.

N1 National-Standard Co.
N2 National Supply Co.
N3 National Tube Div., U. S. Steel Corp.
N5 Nelson Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N14 Northwest. Steel Rolling Mills Inc.
N15 Northwestern S.&W. Co.
N20 Neville Ferro Alloy Co.

O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke&Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Div., Detroit Steel Corp.
P13 Precision Drawn Steel
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., American Chain & Cable
P17 Plymouth Steel Corp.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.
P24 Phil. Steel & Wire Corp.

R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R8 Reliance Div.,EatonMfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Div., Copperweld Steel Co.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service
S41 Stainless & Strip Div., J&L Steel Corp.
S42 Southern Elec. Steel Co.
S43 Seymour Mfg. Co.
S44 Screw & Bolt Corp. of America

T2 Tenn. Coal & Iron Div., U. S. Steel Corp.
T3 Tenn. Products & Chemical Corp.
T4 Texas Steel Co.
T5 Thomas Strip Div., Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div., Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.

U3 Union Wire Rope Corp.
U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div., U. S. Steel Corp.
U11 Union Carbide Metals Co.
U13 Union Steel Corp.

V2 Vanadium-Alloys Steel
V3 Vulcan-Kidd Steel Div., H. K. Porter Co.

W1 Wallace Barnes Steel Div., Associated Spring Corp.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.

Y1 Youngstown Sheet & Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala. City, Ala. (27) R2	5.10
Allenport, Pa. P7	5.10
Alton, Ill. L1	5.30
Ashland, Ky. (8) A10	5.10
Atlanta A11	5.10
Bessemer, Ala. T2	5.10
Birmingham C15	5.10
Buffalo (27) R2	5.10
Conshohocken, Pa. A3	5.15
Detroit M1	5.10
Ecorse, Mich. G5	5.10
Fairfield, Ala. T2	5.10
Farrell, Pa. S3	5.10
Fontana, Calif. K1	5.825
Gary, Ind. U5	5.10
Ind. Harbor, Ind. I-2, Y1	5.10
Johnstown, Pa. (25) B2	5.10
Lackaw'na, N.Y. (25) B2	5.10
LosAngeles (25) B3	5.85
LosAngeles C1	8.60
Minnequa, Colo. C10	6.20
Riverdale, Ill. A1	5.10
SanFrancisco S7	6.60
Seattle (25) B3	6.10
Seattle N14	6.60
Sharon, Pa. S3	5.10
S. Chicago, Ill. W14	5.10
S. SanFrancisco (25) B3	5.85
SparrowsPoint, Md. B2	5.10
Torrance, Calif. C11	5.85
Warren, O. R2	5.10
Weirton, W. Va. W6	5.10
Youngstown U5	5.10

STRIP, Hot-Rolled Alloy

Carnegie, Pa. S18	8.40
Farrell, Pa. S3	8.40
Gary, Ind. U5	8.40
Houston S5	8.65
Ind. Harbor, Ind. Y1	8.40
KansasCity, Mo. S5	8.65
LosAngeles B3	9.60
Lowellville, O. S3	8.40
Newport, Ky. A2	8.40
Sharon, Pa. A2, S3	8.40
S. Chicago, Ill. W14	8.40
Youngstown U5, Y1	8.40

STRIP, Hot-Rolled High-Strength, Low-Alloy

Ashland, Ky. A10	7.575
Bessemer, Ala. T2	7.575
Conshohocken, Pa. A3	7.575
Ecorse, Mich. G5	7.575
Fairfield, Ala. T2	7.575
Farrell, Pa. S3	7.575
Gary, Ind. U5	7.575
Ind. Harbor, Ind. I-2, Y1	7.575
Lackawanna, N.Y. B2	7.575
LosAngeles (25) B3	8.325
Seattle (25) B3	8.575
Sharon, Pa. S3	7.575
S. Chicago, Ill. W14	7.575
S. SanFrancisco (25) B3	8.325
SparrowsPoint, Md. B2	7.575
Warren, O. R2	7.575
Weirton, W. Va. W6	7.575
Youngstown U5, Y1	7.575

STRIP, Hot-Rolled Ingot Iron

Ashland, Ky. (8) A10	5.35
Warren, O. R2	5.875

STRIP, Cold-Rolled Carbon

Anderson, Ind. G6	7.425
Baltimore T6	7.425
Boston T6	7.975
Buffalo S40	7.425
Cleveland A7, J5	7.425
Dearborn, Mich. S3	7.425
Detroit D2, M1, P20	7.425
Dover, O. G6	7.425
Evanston, Ill. M22	7.525
Farrell, Pa. S3	7.425
Follansbee, W. Va. W10	7.425
Fontana, Calif. K1	9.20
FranklinPark, Ill. T6	7.525
Ind. Harbor, Ind. Y1	7.425
Indianapolis S41	7.575
LosAngeles C1, S41	9.30
McKeesport, Pa. E10	7.525
NewBedford, Mass. R10	7.875
NewBritain, Conn. S15	7.875
NewCastle, Pa. B4, E5	7.425
NewHaven, Conn. D2	7.875
NewKensington, Pa. A6	7.425
Pawtucket, R.I. R3	7.975
Pawtucket, R.I. N8	7.975
Philadelphia P24	7.875
Pittsburgh J5	7.425
Riverdale, Ill. A1	7.525
Rome, N.Y. (32) R6	7.425
Sharon, Pa. S3	7.425
Trenton, N.J. (31) R5	8.875
Wallingford, Conn. W2	7.875
Warren, O. R2, T5	7.425
Worcester, Mass. A7	7.975

STRIP, Cold-Rolled Alloy

Boston T6	15.90
Carnegie, Pa. S18	15.55
Cleveland A7	15.55
Dover, O. G6	15.55
Farrell, Pa. S3	15.55
FranklinPark, Ill. T6	15.55
Harrison, N.J. S18	15.55
Indianapolis S41	15.70
LosAngeles S41	17.75
Lowellville, O. S3	15.55
Pawtucket, R.I. N8	15.90
Riverdale, Ill. A1	15.55
Sharon, Pa. S3	15.55
Worcester, Mass. A7	15.85
Youngstown S41	15.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7	10.80
Dearborn, Mich. S3	10.80
Dover, O. G6	10.80
Farrell, Pa. S3	10.80
Ind. Harbor, Ind. Y1	10.80
Sharon, Pa. S3	10.80
Warren, O. R2	10.80

STRIP, Cold-Finished Spring Steel (Annealed)

	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	9.50	10.70	12.90	15.90	18.85
Boston T6	9.50	10.70	12.90	15.90	18.85
Bristol, Conn. W1	....	10.70	12.90	16.10	19.30
Carnegie, Pa. S18	8.95	10.40	12.60	15.60	....
Cleveland A7	8.95	10.40	12.60	15.60	18.55
Dearborn, Mich. S3	9.05	10.50	12.70	....	....
Detroit D2	9.05	10.50	12.70	15.70	....
Dover, O. G6	8.95	10.40	12.60	15.60	18.55
Evanston, Ill. M22	8.95	10.40	12.60	15.60	....
Farrell, Pa. S3	8.95	10.40	12.60	15.60	18.55
Fostoria, O. S1	10.05	10.40	12.60	15.60	....
FranklinPark, Ill. T6	9.05	10.40	12.60	15.60	18.55
Harrison, N.J. C18	....	....	12.90	16.10	19.30
Indianapolis S41	9.10	10.55	12.90	15.60	18.55
LosAngeles C1	11.15	12.60	14.80	17.80	....
LosAngeles S41	11.15	12.60	14.80	....	....
NewBritain, Conn. S15	9.40	10.70	12.90	15.90	18.85
NewCastle, Pa. B4, E5	8.95	10.40	12.60	15.60	....
NewHaven, Conn. D2	9.40	10.70	12.90	15.90	....
NewKensington, Pa. A6	9.85	10.40	12.60	15.60	....
NewYork W3	....	10.70	12.90	16.10	19.30
Pawtucket, R.I. N8	8.50	10.70	12.90	15.90	18.85
Riverdale, Ill. A1	9.05	10.40	12.60	15.60	18.55
Rome, N.Y. (32) R6	8.95	10.40	12.60	15.60	18.55
Sharon, Pa. S3	8.95	10.40	12.60	15.60	18.55
Trenton, N.J. R5	....	10.70	12.90	15.90	18.85
Wallingford, Conn. W2	9.40	10.70	12.90	15.90	18.75
Warren, O. T5	8.95	10.40	12.60	15.60	18.55
Worcester, Mass. A7, T6	9.50	10.70	12.90	15.90	18.85
Youngstown S41	8.95	10.40	12.60	15.60	18.55

Spring Steel (Tempered)

			0.80C	1.05C	1.35C
Bristol, Conn. W1	....	....	18.85	22.95	27.80
Buffalo W12	....	....	18.85	....	....
Fostoria, O. S1	....	....	19.05	22.15	....
FranklinPark, Ill. T6	....	....	19.20	23.30	28.15
Harrison, N.J. C18	....	....	18.85	22.95	27.80
New York W3	....	....	18.85	22.95	27.80
Palmer, Mass. W12	....	....	18.85	....	....
Trenton, N.J. R5	....	....	18.85	22.95	27.80
Worcester, Mass. A7, T6	....	....	18.85	22.95	27.80
Youngstown S41	....	....	19.20	23.30	28.15

STRIP, Galvanized (Continuous)

Farrell, Pa. S3	7.50
Sharon, Pa. S3	7.50

TIGHT COOPERAGE HOOP

Atlanta A11	5.65
Farrell, Pa. S3	5.525
Riverdale, Ill. A1	5.675
Sharon, Pa. S3	5.525
Youngstown U5	5.525

STRIP, Cold-Rolled Ingot Iron

Warren, O. R2	8.175

STRIP, C.R. Electrogalvanized

Cleveland A7	7.425*
Dover, O. G6	7.425*
Evanston, Ill. M22	7.525*
McKeesport, Pa. E10	7.50*
Riverdale, Ill. A1	7.525*
Warren, O. B9, S3, T5	7.425*
Worcester, Mass. A7	7.975
Youngstown S41, Y1	7.425*

*Plus galvanizing extras.

STRIP, Cold-Rolled Weirton, W.Va. W6 10.80
Youngstown Y1 10.80

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa, Pa. J5	$9.10	$9.35	$9.75
Fairfield, Ala. T2	9.20	9.45	9.85
Fairless, Pa. U5	9.20	9.45	9.85
Fontana, Calif. K1	9.75	10.00	10.40
Gary, Ind. U5	9.10	9.35	9.75
GraniteCity, Ill. G4	9.20	9.45	9.60
IndianaHarbor, Ind. I-2, Y1	9.10	9.35	9.75
Irvin, Pa. U5	9.10	9.35	9.75
Niles, O. R2	9.10	9.35	9.75
Pittsburg, Calif. C11	9.75	10.00	10.40
SparrowsPoint, Md. B2	9.10	9.35	9.75
Weirton, W. Va. W6	9.10	9.35	9.75
Yorkville, O. W10	9.10	9.35	9.75

ELECTROLYTIC TIN-COATED SHEET (Dollars per 100 lb)

Aliquippa, Pa. J5 (21-27 Ga.)	....	7.90	8.10	....
IndianaHarbor, Ind. Y1 (20-27 Ga.)	....	7.90	....	....
Niles, O. R2 (20-27 Ga.)	....	7.90	8.10	8.30

TIN PLATE, Hot Dipped Common Coke	1.25 lb	1.50 lb
Aliquippa, Pa. J5	$10.40	$10.65
Fairfield, Ala. T2	10.50	10.75
Fontana, Calif. K1	11.05	11.30
Gary, Ind. U5	10.40	10.65
Ind. Harb. Y1	10.40	10.65
Irvin, Pa. U5	10.40	10.65
Pitts., Calif. C11	11.05	11.30
Sp. Pt., Md. B2	10.40	10.65
Weirton, W. Va. W6	10.40	10.65
Yorkville, O. W10	10.40	10.65

BLACK PLATE (Base Box)

Aliquippa, Pa. J5	$8.20
Fairfield, Ala. T2	8.30
Fairless, Pa. U5	8.30
Fontana, Calif. K1	8.85
Gary, Ind. U5	8.20
GraniteCity, Ill. G4	8.30
Ind. Harbor, Ind. I-2, Y1	8.20
Irvin, Pa. U5	8.20
Niles, O. R2	8.20
Pittsburg, Calif. C11	8.85
SparrowsPoint, Md. B2	8.20
Weirton, W. Va. W6	8.20
Yorkville, O. W10	8.20

HOLLOWARE ENAMELING Black Plate (29 Gage)

Aliquippa, Pa. J5	7.85
Gary, Ind. U5	7.85
GraniteCity, Ill. G4	7.95
Ind. Harbor, Ind. Y1	7.85
Irvin, Pa. U5	7.85
Yorkville, O. W10	7.85

MANUFACTURING TERNES (Special Coated, Base Box)

Gary, Ind. U5	$10.05
Irvin, Pa. U5	10.05

SILICON STEEL

C.R. COILS & CUT LENGTHS (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
BeechBottom, W.Va. W10	....	11.70	12.40	13.35	14.65
Brackenridge, Pa. A4	....	....	12.40	13.55	14.65
GraniteCity, Ill. G4	....	9.975*11.30*	12.00*	13.15*	....
IndianaHarbor, Ind. I-2	..	9.875*11.20*	11.90*	13.05*	....
Mansfield, O. E6	....	9.875*11.70	12.40	13.55	14.65
Newport, Ky. A2	....	9.875 11.70*	12.40*	13.55*	14.65*
Niles, O. M21	....	9.875*11.70	12.40	13.55	....
Vandergrift, Pa. U5	....	9.875*11.70	12.40	13.55	14.65
Warren, O. R2	....	9.875*11.70	12.40	13.55	14.65
Zanesville, O. A10	....	.... 11.70†	12.40	13.55	14.65

	Stator
Vandergrift, Pa. U5	8.10
Mansfield, O. E6	8.10
Warren, O. R2 (Silicon Lowcore)	8.10

SHEETS (22 Ga., coils & cut lengths)

Fully Processed (Semiprocessed ½c lower)	T-72	T-65	T-58	T-52
BeechBottom, W.Va. W10	15.70	16.30	16.80	17.85
Vandergrift, Pa. U5	15.70	16.30	16.80	17.85
Zanesville, O. A10	15.70	16.30	16.80	17.85

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge, Pa. A4	....	18.10	19.70	20.20	20.70	15.70††
Butler, Pa. A10	....	....	19.70	20.20	20.70	....
Vandergrift, Pa. U5	17.10	18.10	19.70	20.20	20.70	15.70
Warren, O. R2	....	....	....	....	....	15.70‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed; semiprocessed ½c lower. ††Coils only.

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity, Ala. R2	8.00
Aliquippa, Pa. J5	8.00
Alton, Ill. L1	8.20
Atlanta A1	8.00
Bartonville, Ill. K4	8.10
Buffalo W12	8.00
Chicago W13	8.00
Cleveland A7, C20	8.00
Crawfordsville, Ind. M8	8.10
Donora, Pa. A7	8.00
Duluth A7	8.00
Fairfield, Ala. T2	8.00
Fostoria, O. (24) S1	8.10
Houston S5	8.25
Jacksonville, Fla. M8	8.35
Johnstown, Pa. B2	8.00
Joliet, Ill. A7	8.00
KansasCity, Mo. S5	8.25
Kokomo, Ind. C16	8.10
LosAngeles B3	8.95
Minnequa, Colo. C10	8.25
Monessen, Pa. P7, P16	8.00
Palmer, Mass. W12	8.30
Pittsburg, Calif. C11	8.95
Portsmouth, O. P12	8.00
Rankin, Pa. A7	8.00
S. Chicago, Ill. R2	8.00
S. SanFrancisco C10	8.95
SparrowsPoint, Md. B2	8.10
Sterling, Ill. (1) N15	8.00
Sterling, Ill. N15	8.10
Struthers, O. Y1	8.00
Waukegan, Ill. A7	8.00
Worcester, Mass. A7	8.30

WIRE, Cold Heading Carbon

Elyria, O. W8	8.00

Wire, Gal'd., for ACSR

Bartonville, Ill. K4	12.65
Buffalo W12	13.40
Cleveland A7	12.65
Donora, Pa. A7	12.65
Duluth A7	12.45
Johnstown, Pa. B2	13.40
KansasCity, Mo. U3	12.90
Minnequa, Colo. C10	12.775
Monessen, Pa. P7, P16	12.65
Muncie, Ind. I-7	13.60
NewHaven, Conn. A7	12.95
Palmer, Mass. W12	13.70
Pittsburg, Calif. C11	13.45
Portsmouth, O. P12	12.65
Roebling, N.J. R5	12.95
SparrowsPt., Md. B2	13.50
Struthers, O. Y1	13.40
Trenton, N.J. A7	12.95
Waukegan, Ill. A7	12.65
Worcester, Mass. A7	12.95

WIRE, Upholstery Spring

Aliquippa, Pa. J5	9.75
Alton, Ill. L1	9.95
Buffalo W12	9.75
Cleveland A7	9.75
Donora, Pa. A7	9.75
Duluth A7	9.75
Johnstown, Pa. B2	9.75
KansasCity, Mo. S5, U3	10.00
LosAngeles B3	10.70
Minnequa, Colo. C10	9.95
Monessen, Pa. P7, P16	9.75
NewHaven, Conn. A7	10.05
Palmer, Mass. W12	10.05
Pittsburg, Calif. C11	10.70
Portsmouth, O. P12	9.75
Roebling, N.J. R5	10.05
S. Chicago, Ill. R2	9.75
S. SanFrancisco C10	10.70
SparrowsPt., Md. B2	9.85
Struthers, O. Y1	9.75
Trenton, N.J. A7	10.05
Waukegan, Ill. A7	9.75
Worcester, Mass. A7, J4, T6	10.05

WIRE, Fine & Weaving (8" Coils)

Alton, Ill. L1	16.50
Bartonville, Ill. K4	16.40
Chicago W13	16.30
Cleveland A7	16.30
Crawfordsville, Ind. M8	16.40
Fostoria, O. S1	16.30
Houston S5	16.55
Jacksonville, Fla. M8	16.65
Johnstown, Pa. B2	16.30
KansasCity, Mo. S5	16.55
Kokomo, Ind. C16	16.30
Minnequa, Colo. C16	16.55
Monessen, Pa. P16	16.30
Muncie, Ind. I-7	16.50
Palmer, Mass. W12	16.60
S. SanFrancisco C10	17.15
Waukegan, Ill. A7	16.30
Worcester, Mass. A7, J6	16.60

WIRE, Tire Bead

Bartonville, Ill. K4	17.15
Monessen, Pa. P16	17.15
Roebling, N.J. R5	17.65

ROPE WIRE (A)

Bartonville, Ill. K4	13.45
Buffalo W12	13.45
Fostoria, O. S1	13.45
KansasCity, Mo. U3	13.70
Johnstown, Pa. B2	13.45
Monessen, Pa. P7	13.45
Muncie, Ind. I-7	13.65
Palmer, Mass. W12	13.75
Portsmouth, O. P12	13.45
Roebling, N.J. R5	13.75
St. Louis L8	13.45
SparrowsPt., Md. B2	13.55
Struthers, O. Y1	13.45
Worcester, Mass. J4	13.75

(A) Plow and Mild Plow; add 0.25c for Improved Plow.

Wire, Cold-Rolled Flat

Anderson,Ind. G6	12.35
Baltimore T6	12.65
Boston T6	12.65
Buffalo W12	12.35
Chicago W13	12.45
Cleveland A7	12.35
Crawfordsville,Ind. M8	12.35
Dover,O. G6	12.35
Farrell,Pa. S3	12.35
Fostoria,O. S1	12.35
FranklinPark,Ill. T6	12.45
Kokomo,Ind. C16	12.35
Massillon,O. R8	12.35
Milwaukee C23	12.55
Monessen,Pa. P7, P16	12.35
Palmer,Mass. W12	12.65
Pawtucket,R.I. N8	12.65
Philadelphia P24	12.65
Riverdale,Ill. A1	12.45
Rome,N.Y. R6	12.35
Sharon,Pa. S3	12.35
Trenton,N.J. R5	12.65
Warren,O. B9	12.35
Worcester,Mass. A7,T6	12.65

NAILS, Stock — **Col.**

AlabamaCity,Ala. R2	173
Aliquippa,Pa. J5	173
Atlanta A11	175
Bartonville,Ill. K4	175
Chicago W13	173
Cleveland A9	173
Crawfordsville,Ind. M8	175
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	178
Jacksonville,Fla. M8	175
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	178
Kokomo,Ind. C16	175
Minnequa,Colo. C10	178
Monessen,Pa. P7	173
Pittsburg,Calif. C11	192
Rankin,Pa. A7	173
S.Chicago,Ill. R2	175
SparrowsPt.,Md. B2	175
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	179

(To Wholesalers: per cwt)

Galveston,Tex. D7	$10.30

NAILS, Cut (100 lb kegs)

Wheeling,W.Va. W10	$10.10

POLISHED STAPLES — **Col.**

AlabamaCity,Ala. R2	175
Aliquippa,Pa. J5	173
Atlanta A11	177
Bartonville,Ill. K4	175
Crawfordsville,Ind. M8	177
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	180
Jacksonville,Fla. M8	177
Johnstown,Pa. B2	175
Joliet,Ill. A7	173
KansasCity,Mo. S5	180
Kokomo,Ind. C16	177
Minnequa,Colo. C10	180
Pittsburg,Calif. C11	194
Rankin,Pa. A7	173
S.Chicago,Ill. R2	175
SparrowsPt.,Md. B2	177
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	181

TIE WIRE, Automatic Baler (14½ Ga.)(per 97 lb Net Box)

Coil No. 3150

AlabamaCity,Ala. R2	$9.24
Atlanta A11	10.36
Bartonville,Ill. K4	9.34
Buffalo W12	10.26
Chicago W13	9.24
Crawfordsville,Ind. M8	9.34
Donora,Pa. A7	9.24
Duluth A7	9.24
Fairfield,Ala. T2	9.24
Houston S5	10.51
Jacksonville,Fla. M8	9.34
Johnstown,Pa. B2	10.26
Joliet,Ill. A7	9.24
KansasCity,Mo. S5	10.51
Kokomo,Ind. C16	9.34
LosAngeles B3	11.05
Minnequa,Colo. C10	10.51
Pittsburg,Calif. C11	9.94
S.Chicago,Ill. R2	9.24
S.SanFrancisco C10	11.04
SparrowsPt.,Md. B2	10.36
Sterling,Ill.(37) N15	9.34

Coil No. 6500 Stand.

AlabamaCity,Ala. R2	$9.54
Atlanta A11	10.70
Bartonville,Ill. K4	9.64
Buffalo W12	10.60
Chicago W13	9.54
Crawfordsville,Ind. M8	9.64
Donora,Pa. A7	9.54
Duluth A7	9.54
Fairfield,Ala. T2	9.54
Houston S5	10.85
Jacksonville,Fla. M8	9.64
Johnstown,Pa. B2	10.60
Joliet,Ill. A7	9.54
KansasCity,Mo. S5	10.85
Kokomo,Ind. C16	9.64
LosAngeles B3	11.40
Minnequa,Colo. C10	10.85
Pittsburg,Calif. C11	10.28
S.Chicago,Ill. R2	9.54
S.SanFrancisco C10	11.40
SparrowsPt.,Md. B2	10.70
Sterling,Ill.(37) N15	9.64

Coil No. 6500 Interim

AlabamaCity,Ala. R2	$9.59
Atlanta A11	10.75
Bartonville,Ill. K4	9.69
Buffalo W12	10.65
Chicago W13	9.59
Crawfordsville,Ind M8	9.69
Donora,Pa. A7	9.59
Duluth A7	9.59
Fairfield,Ala. T2	9.59
Houston S5	10.90
Jacksonville,Fla. M8	9.69
Johnstown,Pa. B2	10.65
Joliet,Ill. A7	9.59
KansasCity,Mo. S5	10.90
Kokomo,Ind. C16	9.69
LosAngeles B3	11.45
Minnequa,Colo. C10	10.90
Pittsburg,Calif. C11	10.31
S.Chicago,Ill. R2	9.59
S.SanFrancisco C10	11.45
SparrowsPt.,Md. B2	10.75
Sterling,Ill.(37) N15	9.69

BALE TIES, Single Loop — **Col.**

AlabamaCity,Ala. R2	212
Atlanta A11	214
Bartonville,Ill. K4	214
Crawfordsville,Ind. M8	214
Donora,Pa. A7	212
Duluth A7	212
Fairfield,Ala. T2	212
Houston S5	217
Jacksonville,Fla. M8	214
Joliet,Ill. A7	212
KansasCity,Mo. S5	217
Kokomo,Ind. C16	214
Minnequa,Colo. C10	217
Pittsburg,Calif. C11	236
S.SanFrancisco C10	236
SparrowsPt.,Md. B2	214
Sterling,Ill.(7) N15	214

FENCE POSTS — **Col.**

Birmingham C15	177
ChicagoHts.,Ill. C2, I-2	177
Duluth A7	177
Franklin,Pa. F5	177
Johnstown,Pa. B2	177
Marion,O. P11	177
Minnequa,Colo. C10	182
Tonawanda,N.Y. B12	177

WIRE, Barbed — **Col.**

AlabamaCity,Ala. R2	193**
Aliquippa,Pa. J5	190‖
Atlanta A11	198‖
Bartonville,Ill. K4	198
Crawfordsville,Ind. M8	198
Donora,Pa. A7	193†
Duluth A7	193†
Fairfield,Ala. T2	193†
Houston S5	198**
Jacksonville,Fla. M8	198
Johnstown,Pa. B2	196‖
Joliet,Ill. A7	193†
KansasCity,Mo. S5	198**
Kokomo,Ind. C16	195†
Minnequa,Colo. C10	198**
Monessen,Pa. P7	196‖
Pittsburg,Calif. C11	213†
Rankin,Pa. A7	193†
S.Chicago,Ill. R2	193**
S.SanFrancisco C10	213*
SparrowsPoint,Md. B2	198‖
Sterling,Ill.(7) N15	198

WOVEN FENCE, 9-15 Ga. — **Col.**

Ala.City,Ala. R2	187**
Aliq'ppa,Pa.9-11½ga.J5	190‖
Atlanta A11	192‖
Bartonville,Ill K4	192
Crawfordsville,Ind. M8	192
Donora,Pa. A7	187†
Duluth A7	187†
Fairfield,Ala. T2	187†
Houston S5	192**
Jacksonville,Fla. M8	192
Johnstown,Pa.(43) B2	190‖
Joliet,Ill. A7	187†
KansasCity,Mo. S5	192**
Kokomo,Ind. C16	189†
Minnequa,Colo. C10	192**
Pittsburg,Calif. C11	210†
Rankin,Pa. A7	187†
S.Chicago,Ill. R2	187**
Sterling,Ill.(7) N15	192

WIRE (16 gage)	**An'ld Galv. Stone**	**Stone**
Ala.City,Ala.R2	17.85	19.40**
Aliq'ppa,Pa. J5	17.85	19.65
Bartonville K4	17.95	19.80
Cleveland A7	17.85	....
Craw'dville B8	17.95	19.80‡‡
Fostoria,O. S1	18.35	19.90†
Houston S5	18.10	19.65**
Jacksonville M8	18.95	19.80‡‡
Johnstown B2	17.85	19.65‖
Kan.City,Mo. S5	18.10	....
Kokomo C16	17.25	18.80†
Minnequa C10	18.10	19.65**
P'lm'r,Mass.W12	18.15	19.70†
Pitts.Calif. C11	18.20	19.75†
S.SanFran. C10	18.20	19.75**
St'ling(37) N15	17.95	19.80
SparrowsPt. B2	17.95	19.75‖
Waukegan A7	17.85	19.40†
Worcester A7	18.15	....

WIRE, Merchant Quality (6 to 8 gage)	**An'd Galv.**
Ala.City,Ala. R2	9.00 9.55**
Aliquippa J5	8.65 9.325‖
Atlanta(48)A11	9.10 9.775‖
Bartonville(48) K4	9.10 9.80
Buffalo W12	9.00 9.55†
Cleveland A7	9.00 ....
Crawfordsville M8	9.10 9.80††
Donora,Pa. A7	9.00 9.55†
Duluth A7	9.00 9.55†
Fairfield T2	9.00 9.55†
Houston(48) S5	9.25 9.80**
Jack'ville,Fla. M8	9.10 9.80‡‡
Johnstown(48) B2	9.00 9.675‖
Joliet,Ill. A7	9.00 9.55†
KansCity(48) S5	9.25 9.80**
Kokomo(48) S16	9.10 9.65†
LosAngeles B3	9.95 10.625‖
Monessen(48) P7	8.65 9.35‖
Palmer,Mass. W12	9.30 9.85†
Pitts.,Calif. C11	9.95 10.50†
Rankin,Pa. A7	9.00 9.55†
S.Chicago R2	9.00 9.55**
S.SanFran. C10	9.95 10.50**
Spar'wsPt.(48)B2	9.10 9.775‖
St'ling(37)(48) N15	9.10 9.80
Struthers,O. Y1	9.00 9.65‡
Worcester,Mass.A7	9.30 9.85†

Based on zinc price of: *13.50. †5c. ‖10c. ‡Less than 10c. ††10.50c. ‡‡11.00c. **Subject to zinc equalization extras.

FASTENERS

(Consumer discounts, per cent off list prices dated November, 1959, orders for 1 container for assorted sizes; for less than container quantities, add 25 per cent)

Hex Head Cap Screws, UNC or UNF, packaged or bulk, with or without hex nuts, 1020 steel bright and high carbon heat treated, ¼ in. thru 1 in. diam., listed lengths:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	43.75
Bulk	50

BOLTS, standard stock sizes:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	43.75
*Bulk	50

*Hot galvanized or zinc plated lag bolts only—for package or bulk quantities use applicable list less bulk discounts.

HEXAGON NUTS, American Standard: Finished hex, hex jam, and hex slotted (UNC or UNF), ¼ in. through 3 in., finished hex thick, thick and slotted, castle (UNF), ¼ in. through 1½ in., semi-finished hex heavy, heavy and jam, heavy and slotted, (UNC), ⅛ in. through 4 in., and

SQUARE NUTS, American Standard: Regular square and heavy square (UNC) ¼ in. through 2 in.:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	43.75
Bulk	50

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh; f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great.

Structural ½ in., larger 12.85

⅞ in. and smaller by 6 in. and shorter: 15% off list.

PRESTRESSED STRAND

(High strength, stress relieved; 7 wire uncoated. Net prices per 1000 ft, 40,000 lb and over)

	Standard Diameter, Inches 1/4	5/16	3/8	7/16	1/2
Alton,Ill. L1	$28.95	$43.40	$55.40	$73.00	$95.10
Buffalo W12	28.95	43.40	55.40	73.00	95.10
Cleveland A7	28.95	43.40	55.40	73.00	....
KansasCity,Mo. U3	29.85	43.00	56.40	73.00	95.10
Monessen,Pa. P16	32.15	48.20	61.55	81.10	105.65
NewHaven,Conn. A7	28.95	43.40	55.40	73.00	95.10
Pittsburg,Calif. C11	28.95	43.40	55.40	73.00	95.10
Pueblo,Colo. C10	28.95	43.40	55.40	73.00	95.10
Roebling,N.J. R5	28.95	43.40	55.40	73.00	95.10
SparrowsPoint,Md. B2	28.95	43.40	55.40	73.00	95.10
St.Louis L8	28.95	43.40	55.40	73.00	95.10
Waukegan,Ill. A7	28.95	43.40	55.40	73.00	95.10

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	27.24	23.13
1¼	13	....	32.25	24.41
1½	13	30.42	35.65	26.98
1¾	13	35.94	42.12	31.89
2	13	40.28	47.21	35.74
2¼	13	45.36	53.17	40.26
2¼	12	49.24	57.72	43.70
2½	12	54.23	63.57	48.13
2¾	12	58.73	68.83	52.13
3	12	62.62	73.40	55.59

RAILWAY MATERIALS

Rails	Standard No. 1	Standard No. 2	All No. 2	Tee Rails 60 lb Under
Bessemer,Pa. U5	5.75	5.60	....	6.725
Ensley,A.a. T2	5.75	5.65	....	6.725
Fairfield,Ala. T2	....	....	....	6.725
Gary,Ind. U5	5.75	5.65	....	....
Huntington,W.Va. C15	....	....	....	6.725
Johnstown,Pa. B2	....	....	....	(16)6.725
Lackawanna,N.Y. B2	5.75	5.65	....	6.725
Minnequa,Colo. C10	5.75	5.65	....	7.225
Steelton,Pa. B2	5.75	5.65	....	....
Williamsport,Pa. S19	....	....	....	6.725

TIE PLATES

Fairfield,Ala. T2	6.875
Gary,Ind. U5	6.875
Lackawanna,N.Y. B2	6.875
Minnequa,Colo. C10	6.875
Seattle B3	7.025
Steelton,Pa. B2	6.875
Torrance,Calif. C11	6.875

JOINT BARS

Bessemer,Pa. U5	7.25
Fairfield,Ala. T2	7.25
Joliet,Ill. U5	7.25
Lackawanna,N.Y. B2	7.25
Minnequa,Colo. C10	7.25
Steelton,Pa. B2	7.25

AXLES

Ind.Harbor,Ind. S13	9.125
Johnstown,Pa. B2	9.125

TRACK BOLTS, Untreated

Cleveland R2	15.35
KansasCity,Mo. S5	15.35
Lebanon,Pa. B2	15.35
Minnequa,Colo C10	15.35
Pittsburgh S44	15.35
Seattle B3	15.85

SCREW SPIKES

Lebanon,Pa. B2	15.10

STANDARD TRACK SPIKES

Fairfield,Ala. T2	10.10
Ind.Harbor,Ind. I-2,Y1	10.10
KansasCity,Mo. S5	10.10
Lebanon,Pa. B2	10.10
Minnequa,Colo. C10	10.10
Pittsburgh J5	10.10
Seattle B3	10.60
S.Chicago,Ill. R2	10.10
Struthers,O. Y1	10.10
Youngstown R2	10.10

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1½ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in., 6.70c; 1 15/16 to 8 in., inclusive, 7.05c.
(6) Chicago or Birm. base.
(7) Chicago base 2 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅜" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(21) New Haven, Conn., base.
(23) Deld. San Francisco Bay area.
(23) Special quality.
(34) Deduct 0.05c. finer than 15 Ga.
(25) Bar mill bands.
(28) Dwld. in mill zone, 6.295c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝ in.; 7.375c, for widths ⅝ in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) Chicago base, 10 points lower.
(38) 13 Ga. & lighter; 60" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.635c.
(43) 9-14½ Ga.
(44) To fabricators.
(48) 6-7 Ga.
(49) 3½ in. and smaller rounds 9.65c, over 3½ in. and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25
Ambridge, Pa. N2	+12.25	....	+5.75	....	+3.25	....	+1.75	....	+1.75	....	+2	....	0.5	....
Lorain, O. N3	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25
Youngstown Y1	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25

ELECTRICWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Alton, Ill. L1	....	....	....	....	....	....	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Benwood, W. Va. W10	1.5	+27	+10.5	+36	+21	+45.5	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Butler, Pa. F6	4.5	+24	+8.5	+34	+19.5	+44	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Fairless, Pa. N3	....	....	....	....	....	....	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Fontana, Calif. K1	....	....	....	....	....	....	+10.75	+28	+7.75	+24	+4.25	+19.5	+1.75	+18.25
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	1.25	+16	4.25	+12	7.75	+7.5	10.25	+7.75
Lorain, O. N3	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Sharon, Pa. S4	4.5	+24	+8.5	+34	+19.5	+44	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Sparrows Pt., Md. B2	2.5	+26	+10.5	+36	+21.5	+46	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Wheatland, Pa. W9	4.5	+24	+8.5	+34	+19.5	+44	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Youngstown R2, Y1	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25

Size—Inches	1¼		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.72		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Alton, Ill. L1	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Benwood, W. Va. W10	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Etna, Pa. N2	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Fairless, Pa. N3	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+6.5	1.25	+16.5	1.25	+16.5
Fontana, Calif. K1	+1.25	+17.25	+0.75	+16.75	0.75	+16.5	0.75	+16.5	+9.75	+27.5	+9.75	+27.5
Indiana Harbor, Ind. Y1	10.75	+5.25	11.25	+4.75	12.75	+4.5	12.75	+4.5	2.25	+15.5	2.25	+15.5
Lorain, O. N3	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	....	....	....	....
Sharon, Pa. M6	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	....	....	....	....
Sparrows Pt., Md. B2	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Wheatland, Pa. W9	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Youngstown R2, Y1	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5

*Galvanized pipe discounts based on price of zinc at 12.50c, East St. Louis.

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	Rerolling: Ingot	Rerolling: Slabs	Forging Billets	H.R. Strip	H.R. Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	22.75	25.00	....	36.00	....	43.50	39.25	48.50	45.00
202	24.75	28.25	37.75	39.00	42.25	44.50	40.00	49.25	49.25
301	24.00	26.00	38.75	37.25	43.50	46.00	41.25	51.25	47.50
302	26.25	29.50	39.50	40.50	44.25	46.75	42.25	52.00	52.00
302B	26.50	30.75	42.25	45.75	46.75	49.00	44.50	57.00	57.00
303	....	33.25	42.50	....	47.25	49.75	45.00	56.75	56.75
304	28.00	31.25	42.00	43.75	47.00	49.50	45.75	55.00	55.00
304L	....	....	49.75	51.50	54.75	57.25	53.50	62.75	62.75
305	29.50	34.75	44.00	47.50	47.00	49.50	46.25	58.75	58.75
308	32.00	36.25	49.00	50.25	54.75	57.75	55.25	63.00	63.00
309	41.25	47.50	60.00	64.50	66.25	69.50	66.00	80.50	80.50
310	51.50	59.50	81.00	84.25	89.75	94.50	87.75	96.75	96.75
314	....	....	80.50	....	89.75	94.50	87.75	....	104.25
316	41.25	47.50	64.50	68.50	71.25	75.75	71.75	80.75	80.75
316L	....	....	72.25	76.25	79.50	83.50	79.50	88.50	88.50
317	49.75	58.00	79.75	88.25	89.50	94.25	88.50	101.00	101.00
321	33.50	38.00	48.75	53.50	54.50	57.50	54.75	65.00	65.50
330	....	....	123.25	....	113.00	143.75	135.00	149.25	149.25
18-8 CbTa	38.50	48.25	57.75	63.50	63.75	67.25	64.75	79.25	79.25
403	....	....	29.25	....	33.25	35.00	30.00	40.25	40.25
405	20.25	26.50	30.75	36.00	34.75	36.50	32.50	46.75	46.75
410	17.50	19.50	29.25	31.00	33.25	35.00	30.00	40.25	40.25
416	....	....	29.75	....	33.75	35.50	31.25	48.25	48.25
420	....	31.50	35.50	41.75	40.75	42.75	40.25	62.00	62.00
430	17.75	19.75	29.75	32.00	33.75	35.50	31.00	40.75	40.75
430F	....	....	....	30.50	....	34.25	36.00	31.75	51.75	51.75
431	....	....	29.75	39.25	....	43.50	46.00	41.00	56.00	56.00
446	....	....	....	40.75	59.00	46.00	48.25	42.75	70.00	70.00

Producers Are: Allegheny Ludlum Steel Corp.; American Steel & Wire Div., U. S. Steel Corp.; Anchor Drawn Steel Co., division of Vanadium-Alloys Steel Co.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; A. M. Byers Co.; Calstrip Steel Corp.; G. O. Carlson Inc.; Carpenter Steel Co.; Carpenter Steel Co. of New England; Charter Wire Products; Crucible Steel Co. of America; Damascus Tube Co.; Dearborn Div., Sharon Steel Corp.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Firth Sterling Inc.; Fort Wayne Metals Inc.; Green River Steel Corp., subsidiary of Jessop Steel Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Ellwood Ivins Steel Tube Works Inc.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Stainless & Strip Div., Jones & Laughlin Steel Corp.; Joslyn Stainless Steels, division of Joslyn Mfg. & Supply Co.; Latrobe Steel Co.; Lukens Steel Co.; Maryland Fins & Specialty Wire Co. Inc.; McLouth Steel Corp.; Metal Forming Corp.; Midvale-Heppenstall Co.; National Standard Co.; National Tube Div., U. S. Steel Corp.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Riverside-Alloy Metal Div., H. K. Porter Company Inc.; Rodney Metals Inc.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Standard Tube Co.; Superior Steel Div., Copperweld Steel Co.; Superior Tube Co.; Swepco Tube Corp.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co., subsidiary of Crucible Steel Co. of America; Tube Methods Inc.; Ulbrich Stainless Steel Inc.; Union Steel Corp.; U. S. Steel Corp.; Universal Cyclops Steel Corp.; Vanadium-Alloys Steel Co.; Wall Tube & Metal Products Co.; Wallingford Steel, subsidiary Allegheny Ludlum Steel Corp.; Washington Steel Corp.; Seymour Mfg. Co.

Clad Steel

	Plates: 5%	Plates: Carbon Base 10%	Plates: Carbon Base 15%	Plates: Carbon Base 20%	Sheets: Carbon Base 20%
Stainless					
302	....	....	....	....	37.50
304	26.05	28.80	31.55	34.30	39.75
304L	30.50	33.75	36.95	40.15	....
316	38.20	42.20	46.25	50.25	58.25
316L	42.30	46.75	51.20	55.65	....
316 Cb	49.90	55.15	60.40	65.65	....
321	31.20	34.50	37.75	41.05	47.25
347	36.90	40.80	44.65	48.56	57.00
405	22.25	24.60	26.90	29.25	....
410	20.55	22.70	24.85	27.00	....
430	21.20	23.45	25.65	27.90	....
Inconel	48.90	59.55	70.15	80.55	....
Nickel	41.65	51.95	63.30	72.70	....
Nickel, Low Carbon	41.95	52.60	63.30	74.15	....
Monel	43.35	53.55	63.80	74.05	....

	Strip, Carbon Base —Cold Rolled— 10%	Strip, Carbon Base —Cold Rolled— Both Sides
Copper*	$38.80	$44.20

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4, and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Reg. Carbon (W-1)	0.330	V-Cr Hot Work (H-13)	0.550
Spec. Carbon (W-1)	0.385	W-Cr Hot Work (H-12)	0.530
Oil Hardening (O-1)	0.505	W Hot Wk. (H-21)	1.425-1.44
V-Cr Hot Work (H-11)	0.505	Hi-Carbon-Cr (D-11)	0.955

Grade by Analysis (%) W	Cr	V	Co	Mo	AISI Designation	$ per lb
18	4	1	....	....	T-1	1.840
18	4	2	....	....	T-2	2.005
13.5	4	3	....	....	T-3	2.105
18.25	4.25	1	4.75	....	T-4	2.545
18	4	2	9	....	T-5	2.915
20.25	4.25	1.6	12.95	....	T-6	4.330
13.75	3.75	2	5	....	T-8	2.485
1.5	4	1	....	8.5	M-1	1.200
6.4	4.5	1.9	....	5	M-2	1.345
6	4	3	....	6	M-3	1.590

Tool steel producers include: A4, A8, B2, B8, C4, C9, C12, C18, F2, J3, L3, M14, S8, U4, V2, and V3.

HOW TROUBLE-FREE ARE YOUR ROD and BAR CUTTING OPERATIONS?

Check them with the—

HKP PORTER *Hydraulic*
ONE-HOSE
ROD and BAR CUTTER

IT'S PRACTICALLY . . .

MAINTENANCE FREE!

To slash those sky-high costs on bar and rod cutting operations and maintenance in your mill you need the superbly efficient, rugged, trouble-free one-hose PORTER HYDRAULIC ROD and BAR CUTTER. An all-job team of 3 Cutterheads and 5 Power Unit sizes offers just the right combination to handle any of your cutting work — faster better and at far lower cost. Here's why:

CONTINUOUS TROUBLE-FREE OPERATION

CUTTERHEAD PROTECTION — that eliminates constant "TIME OUT" and HIGH MAINTENANCE COSTS!

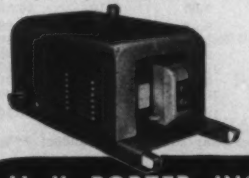
- **LONGER BLADES** with more bearing surface and rigid alignment eliminate side thrust and blade breakage.
- **FILTERED AIR** taken into the cylinder is forced out around the movable blade on each cut — eliminates the danger of dirt reaching bearing surface causing oil leakage and wear.
- **CONCENTRIC DESIGN** eliminates excessive wear of cylinder wall and ram.
- **LARGER CYLINDER AREA** allows the tool to cut capacity stock at a lower operating pressure, resulting in longer life for seal and hose.
- **SAFE, 12 VOLT CONTROL SWITCH** at the cutterhead gives instant finger-tip performance.
- **"KEY-POINT"** wear and replacement reduced to the minimum because of these exclusive HKP features.

A TRUE HYDRAULIC SYSTEM with these efficient, maintenance-saving features:

- **CONTROL VALVE** big and accurate enough for all industrial work. Solenoid operated.
- **EASY TO CHANGE RESERVOIR TYPE 10-MICRON OIL FILTER.**
- **PLUS** many other exclusive HKP features.

Ask to have a Porter Engineer tell you how the 3 CUTTERHEAD sizes and 5 HYDRAULIC POWER UNITS can provide the exact combination for your requirements.

OR — WRITE FOR COMPLETE PORTER HYDRAULIC ROD and BAR CUTTER FOLDER.

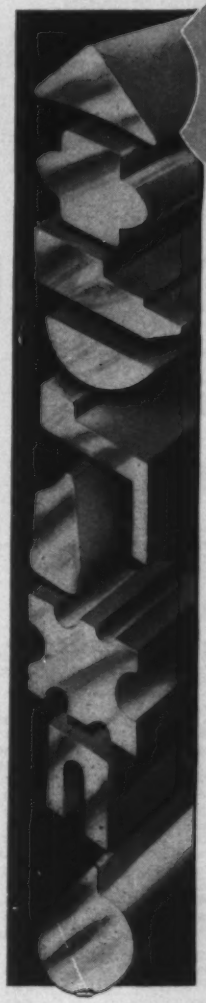


ATTENTION! Production and Quality Control Depts. Ask about our **NEW UPSET TESTING MACHINE!**

H. K. PORTER, INC. Somerville 43, Mass.

Moltrup Steel

COLD DRAWN



Special SHAPES

Save Time—Cut Cost

Order the exact shapes needed. Any special shape—as well as all standard shapes—drawn to the exceptionally close tolerances that have made MOLTRUP the quality name in steel for over 65 years.

Prompt Delivery...

Your order or request for quotation will receive immediate attention. Please include blueprint and specification of special shape or shapes desired. Shipments direct from our plant.

Precision Products...

Cold Drawn Carbon, Alloy, and Leaded Steels—Screw Stock—Key Stock—Turned and Polished Shafting — Machine Keys — Pins — Flattened, Ground and Polished Plates —Foundry Pattern, Core and Bottom Plates.

Consult telephone directory, in cities listed, or ask us for name of distributor nearest you.

Phone: Tilden 6-3100

Moltrup *Steel Products Co.*
BEAVER FALLS, PA.

Pittsburgh, Pa. Erie, Pa. Chicago, Ill. Detroit, Mich.
New York, N. Y. Syracuse, N. Y. Cincinnati, O.
Cleveland, O. Los Angeles, Calif.

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate.

	Basic	No. 2 Foundry	Malle-able	Besse-mer
Birmingham District				
Birmingham R2	62.00	62.50**	....	....
Birmingham U6	....	62.50**	66.50	....
Woodward, Ala. W15	62.00*	62.50**	66.50	....
Cincinnati, deld.	....	70.20	....	....
Buffalo District				
Buffalo H1, R2	66.00	66.50	67.00	67.50
N. Tonawanda, N.Y. T9	....	66.50	67.00	67.50
Tonawanda, N.Y. W12	66.00	66.50	67.00	67.50
Boston, deld.	77.29	77.79	78.29	....
Rochester, N.Y., deld.	69.02	69.52	70.02	....
Syracuse, N.Y., deld.	70.12	70.62	71.12	....
Chicago District				
Chicago I-3	66.00	66.50	66.50	67.00
S. Chicago, Ill. R2	66.00	66.50	66.50	67.00
S. Chicago, Ill. W14	66.00	....	66.50	67.00
Milwaukee, deld.	69.02	69.52	69.52	70.02
Muskegon, Mich., deld.	....	74.52	74.52	....
Cleveland District				
Cleveland R2, A7	66.00	66.50	66.50	67.00
Akron, Ohio, deld.	69.52	70.02	70.02	70.52
Mid-Atlantic District				
Birdsboro, Pa. B10	68.00	68.50	69.00	69.50
Chester, Pa. P4	68.00	68.50	69.00	....
Swedeland, Pa. A3	68.00	68.50	69.00	69.50
New York, deld.	....	75.50	76.00	....
Newark, N.J., deld.	72.69	73.19	73.69	74.19
Philadelphia, deld.	70.41	70.91	71.41	71.99
Troy, N.Y. R2	68.00	68.50	69.00	69.50
Pittsburgh District				
Neville Island, Pa. P6	66.00	66.50	66.50	67.00
Pittsburgh (N&S sides), Aliquippa, deld.	....	67.95	67.95	68.48
McKees Rocks, Pa., deld.	....	67.60	67.60	68.13
Lawrenceville, Homestead, Wilmerding, Monaca, Pa., deld.	....	68.26	68.26	69.79
Verona, Trafford, Pa., deld.	68.29	68.82	68.82	69.35
Brackenridge, Pa., deld.	68.60	69.10	69.10	69.63
Midland, Pa. C18	66.00	....	....	....
Youngstown District				
Hubbard, Ohio Y1	....	....	66.50	....
Sharpsville, Pa. S6	66.00	....	66.50	67.00
Youngstown Y1	....	....	66.50	....
Mansfield, Ohio, deld.	71.30	....	71.80	72.30
Duluth I-3	66.00	66.50	66.50	67.00
Erie, Pa. I-3	66.00	66.50	66.50	67.00
Everett, Mass. E1	67.50	68.00	68.50	....
Fontana, Calif. K1	75.00	75.50	....	....
Geneva, Utah C11	66.00	66.50	....	....
Granite City, Ill. G4	67.90	68.40	68.90	....
Ironton, Utah C11	66.00	66.50	....	....
Minnequa, Colo. C10	68.00	68.50	69.00	....
Rockwood, Tenn. T3	....	62.50‡	66.50	....
Toledo, Ohio I-3	66.00	66.50	66.50	67.00
Cincinnati, deld.	72.94	73.44	....	....

*Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.
**Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.50.
‡Phos. 0.50% up; Phos. 0.30-0.49%, $63.50.

PIG IRON DIFFERENTIALS

Silicon: Add 75 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.25% manganese over 1% or portion thereof.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.01-6.50% silicon; add 75c for each 0.50% silicon or portion thereof over the base grade within a range of 6.50 to 11.50%; starting with silicon over 11.50% add $1.50 per ton for each 0.50% silicon or portion thereof up to 14%; add $1 for each 0.50% Mn over 1%)

Jackson, Ohio I-3, J1	$78.00
Buffalo H1	79.25

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1.25 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

Calvert City, Ky. P15	$99.00
Niagara Falls, N.Y. P15	99.00
Keokuk, Iowa Open-hearth & Fdry, K2	89.00
Keokuk, Iowa O.H. & Fdry, 12½ lb piglets, 16% Si, K2	92.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles, Tenn. T3 (Phos. 0.035% max)	$73.00
Rockwood, Tenn. T3 (Phos. 0.035% max)	73.00
Troy, N.Y. R2 (Phos. 0.075% max)	73.00
Swedeland, Pa. A3 (Intermediate) (Phos. 0.036-0.075% max)	73.00
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075%)	71.00
Erie, Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Neville Island, Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	71.00

Steel Service Center Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: Denver, Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, Spokane, San Francisco, 10 cents; Atlanta, Birmingham, Chattanooga, Houston, Seattle, no change.

	SHEETS				STRIP	BARS			Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Galv. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Rounds	C.F. Rds.‡	H.R. Alloy 4140††‡		Carbon	Floor
Atlanta	8.59§	9.86§	10.13	....	8.91	9.39	13.24#	....	9.40	9.29	11.21
Baltimore	9.80[a]	10.00[b]	10.06	....	11.45[c]	10.05[d]	11.80#	16.38	9.55	9.90[e]	10.50
Birmingham	9.43[a]	10.20[b]	....	....	10.91[c]	9.59[d]	13.14#	16.76	9.00	9.79[e]	10.90
Boston	10.07	11.42	11.77	53.50	12.17	10.19	13.30#	15.64	10.64	10.27	11.95
Buffalo	8.40	9.60	11.25	55.98	8.75	9.15	11.45#	15.40	9.25	9.20	10.75
Chattanooga	8.35	9.69	9.65	....	8.40	8.77	10.46	....	8.88	8.80	10.66
Chicago	8.25	9.45	10.90	53.00	8.51	8.99	9.15	15.05	9.00	8.89	10.20
Cincinnati	8.43	9.51	10.95	53.43	8.83	9.31	11.58#	15.37	9.56	9.27	10.53
Cleveland	8.54[a]	8.79[b]	10.94	52.33	10.32[c]	8.75[d]	11.25#	15.16	9.39	8.71[e]	10.50[f]
Dallas	8.80	9.30	....	....	8.85	8.80	....	....	8.75	9.15	10.40
Denver	9.40	11.84	12.94	....	9.43	9.80	11.19	....	9.84	9.76	11.08
Detroit	8.51	9.71	11.25	56.50	8.88	9.30	9.51	15.33	9.56	9.26	10.46
Erie, Pa.	8.35	9.45	9.95[10]	....	8.60	9.10	11.25	....	9.35	9.10	10.60
Houston	9.65[a]	9.65[b]	....	52.00	10.35[c]	8.90[d]	13.10#	16.55	8.35	9.65[e]	10.10
Jackson, Miss.	8.52	9.79	....	....	8.84	9.82	10.68	....	9.33	9.22	11.03
Los Angeles	8.70[2]	10.82[2]	12.20	57.60	9.15	9.10[2]	12.95[2]	16.35	9.00[2]	9.10[2]	11.30[2]
Memphis, Tenn.	8.59	9.80	....	....	8.84	9.32	11.25#	....	9.33	9.22	10.86
Milwaukee	8.39	9.59	11.04	....	8.65	9.13	9.39	15.19	9.22	9.03	10.34
Moline, Ill.	8.55	9.80	....	....	8.84	8.95	9.15	....	8.99	8.91	....
New York	9.17	10.49	11.35	53.08	9.64	9.99	13.25#	15.50	9.74	9.77	11.05
Norfolk, Va.	8.65	....	....	....	9.15	9.30	12.75	....	9.65	9.10	10.50
Philadelphia	8.20	9.55	10.89	52.17	9.25	9.40	11.95#	15.48	9.10	9.15	10.40**
Pittsburgh	8.54[a]	8.79[b]	10.76	52.33	10.30[c]	8.64[d]	11.25#	15.05	9.00	8.47[e]	10.26[f]
Richmond, Va.	8.65	....	10.79	....	9.15	9.55	....	....	9.65	9.10	10.60
St. Louis	8.63	9.83	11.28	....	8.89	9.37	9.78	15.43	9.48	9.27	10.58
St. Paul	8.80[a]	9.31[b]	10.54	....	10.32[c]	8.70[d]	11.49#	16.54	9.38	8.60[e]	10.49
San Francisco	9.65	11.10	11.40	55.10	9.75	10.15	13.60	16.25	9.85	10.00	12.35
Seattle	10.30	11.55	12.50	56.52	10.25	10.50	14.70	16.80[2]	10.20	10.10	12.50
South'ton, Conn.	9.07	10.33	10.71	....	9.48	9.74	....	....	9.57	9.57	10.91
Spokane	10.30	11.55	12.50	57.38	10.75	11.00	14.70	16.80	10.20	10.10	13.00
Washington	9.15	....	....	....	9.65	10.05	12.50	....	10.15	9.60	11.10

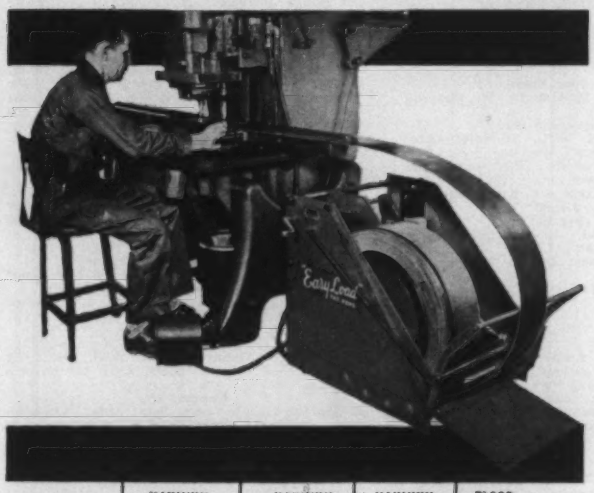
*Prices do not include gage extras; †prices include gage and coating extras; ‡includes 35-cent bar quality extras; §42 in. and under; **¼ in. and heavier; ††as annealed; ‡‡¾ in. to 4 in. wide, inclusive; #net price, 1 in. round C-1018.

[a]10 Ga.; [b]20 Ga.; [c]¼ x 1 in.; [d]¾-2½ in.; [e]¼ x 84 in.; [f]¼ x 36 in.

Base quantities, 2000 to 4999 lb except as noted; cold-finished bars, 2000 lb and over except in Seattle, 2000 to 3999 lb; stainless sheets, 8000 lb except in Chicago, New York, Boston, Seattle, 10,000 lb and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb, except in Seattle, 30,000 lb and over; [2]—30,000 lb; [5]—1000 to 4999 lb; [10]—1000 to 1999 lb; [10]—2000 lb and over.

reduce set-up time and lower production costs

WITH ROWE 800 SERIES "Easy Load" COIL CRADLES



MODEL	MAXIMUM CAPACITY WEIGHT	MAXIMUM WIDTH CAPACITY	MAXIMUM O.D. CAPACITY	FLOOR SPACE REQUIRED
810	1200#	10"	36"	15" x 30"
815	1200#	15"	36"	20" x 30"
820	1200#	20"	36"	25" x 30"
824	1200#	24"	36"	29" x 30"

When you are *in production* with ROWE "Easy Load" Coil Cradles, you are getting precision coil handling that reduces your set-up time and cuts your costs. Instant coil positioning by means of the adjustable side guide plus positive feeding action puts most materials exactly where it should be without underfeeding or overrunning. All 800 Series "Easy Load" Cradles can be moved from station to station by one man quickly and easily. They work equally well with manual or automatic feeding arrangements. Reduced-friction side guides pay off the coil without binding or scratching.

If you use coil stock for production items, the Rowe "Easy Load" 800 Series Cradle can increase the accuracy, efficiency and economy of your operation.

Investigate the complete ROWE line. Other equipment includes Coil Cradles to 20,000 pound capacity, Straightening machines, Straightening and Feeding Machines, Cabinet Feeds, Roll Feeds, Coil Catchers and Storage Ramps, Combination Cradle and Straightening Machine Units, Coil Buggies, Reels, Conveyors, Stackers and Complete Sheeting Lines.

Affiliate Member — Associate Member

ROWE MACHINERY AND MANUFACTURING CO. INC.
811 REGAL ROW DALLAS, TEXAS

If METALWORKING PLANTS ARE YOUR PROSPECTS...

- ✔ STEEL can put you in touch with the important ones, those that do more than 92% of the industry's business. Tell the buyers and specifiers in these plants of the machines or materials you have for sale through an "Equipment—Materials" advertisement. For rates write STEEL, Penton Building, Cleveland 13, O.

C ELECTRIC FURNACE STEEL CASTINGS

are engineered to *YOUR* specific requirements

"C" steel castings are CLEAN steel castings of uniform structure that will minimize machining and assembly costs, permit of greater freedom and efficiency of design and add to your product the recognized strength, endurance and desirability of steel. C steel castings, foundry engineered from pattern to finished casting can be had in

CARBON, ALLOY OR STAINLESS STEEL SAND OR SHELL MOULDED

The technical experience and knowledge of our engineering staff are at your service. Write, phone, or call.

CRUCIBLE STEEL CASTING CO.
LANSDOWNE 2, PENNA.

Refractories

Fire Clay Brick (per 1000 pieces*)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchens, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Winburne, Snow Shoe, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parrall, Portsmouth, Ohio, Ottawa, Ill., Stevens Pottery, Ga., Canon City, Colo., $140; Salina, Pa., $145; Niles, Ohio, $138; Cutler, Utah, $175.

Super-Duty: Ironton, Ohio, Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Winburne, Snow Shoe, Pa., New Savage, Md., St. Louis, $185; Stevens Pottery, Ga., $195; Cutler, Utah, $248.

Silica Brick (per 1000 pieces*)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Pt. Matilda, Pa., Portsmouth, Ohio, Hawstone, Pa., St. Louis, $158; Warren, Niles, Windham, Ohio, Hays, Latrobe, Morrisville, Pa., $163; E. Chicago, Ind., Joliet, Rockdale, Ill., $168; Canon City, Colo., $173; Lehi, Utah, $183; Los Angeles, $185.

Super-Duty: Sproul, Hawstone, Pa., Niles, Warren, Windham, Ohio, Leslie, Md., Athens, Tex., $158; Morrisville, Hays, Latrobe, Pa., $163; E. Chicago, Ind., St. Louis, $168; Canon City, Colo., $183; Curtner, Calif., $185.

Semisilica Brick (per 1000 pieces*)

Woodbridge, N. J., Canon City, Colo., $140; Philadelphia, Clearfield, Pa., $145.

Ladle Brick (per 1000 pieces*)

Dry Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Vanport, Pa., Mexico, Vandalia, Mo., Wellsville, Irondale, New Salisbury, Ohio, $96.75; Clearfield, Pa., Portsmouth, Ohio, $102.

High-Alumina Brick (per 1000 pieces*)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., Danville, Ill., $253; Philadelphia, $265; Clearfield, Pa., $230; Orviston, Snow Shoe, Pa., $260.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $310; Danville, Ill., $313; Clearfield, Orviston, Snow Shoe, Pa., $320; Philadelphia, $325.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $350; Danville, Ill., $353; Clearfield, Orviston, Snow Shoe, Pa., $360; Philadelphia, $365.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., St. Louis, $188; Ottawa, Ill., $205.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., St. Louis, $310.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., $234.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, Gibsonburg, Narlo, Ohio, $16.75; Thornton, McCook, Ill., $17; Dolly Siding, Bonne Terre, Mo., $15.60.

Magnesite (per net ton)

Domestic, dead-burned, ½ in. grains with fines: Chewelah, Wash., Luning, Nev., $46; ⅝ in. grains with fines: Baltimore, $73.

*—9 in. x 4½ x 2.50 straights.

Fluorspar

Metallurgical grades, f.o.b. shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $37-$41; 70%, $36-$40; 60%, $33-$36.50. Imported, net ton, f.o.b. cars point of entry, duty paid, metallurgical grade; European, $30-$33, contract; Mexican, all rail, duty paid $26.50-$27; barge, Brownsville, Tex., $29-$29.50.

Ores

Lake Superior Iron Ore

(Prices effective at start of the 1959 shipping season, subject to later revision, gross ton, 51.50% iron natural, rail of vessel, lower lake ports.)

Mesabi bessemer	$11.60
Mesabi nonbessemer	11.45
Old Range bessemer	11.55
Old Range nonbessemer	11.70
Open-hearth lump	12.70
High phos	11.45

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Jan. 1, 1959, and increases or decreases after that date are absorbed by the seller.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

New Jersey, concentrates	nom.

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 65%	21.00†
Brazilian iron ore, 68.5%	21.00

Tungsten Ore

Net ton, unit

Foreign wolframite, good commercial quality	$17.50-18.00*
Domestic, concentrates, f.o.b. milling points	22.00-23.00

*Before duty. †Nominal.

Manganese Ore

Mn 46-48%, Indian 88-90c, nom. per long ton unit, c.i.f. U. S. ports, duty for buyer's account.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian

48% 3:1	$34.00-35.00†
48% no ratio	25.00-26.00†

South African Transvaal

44% no ratio	18.00†
48% no ratio	24.00-26.00†

Turkish

48% 3:1	36.00-37.00†

Domestic

Rail nearest seller

18% 3:1	30.00

Molybdenum

Sulfide concentrate, per lb of Mo content, mines, unpacked	$1.23

Antimony Ore

Per short ton unit of Sb content, c.i.f. seaboard

50-55%	$2.35-2.50
60-65%	2.60-3.20

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

†Nominal.

Electrodes

Threaded with nipple; unboxed, f.o.b. plant

GRAPHITE

Inches Diam	Inches Length	Per 100 lb
2	24	$64.00
2½	30	41.50
3	40	39.25
4	40	37.00
5½	40	36.50
6	60	33.25
7	60	29.75
8, 9, 10	60	29.50
12	72	28.25
14	60	28.25
16	72	27.25
17	60	27.25
18	72	27.00
20	72	26.50
24	84	27.25

CARBON

8	60	14.25
10	60	13.80
12	60	14.75
14	60	14.75
14	72	12.55
17	60	12.65
17	72	12.10
20	90	11.55
24	72, 84	11.95
24	96	12.10
30	84	12.00
35, 40	110	11.60
40	100	12.50

Metal Powder

(Per pound, f.o.b. shipping point in ton lots for minus 100 mesh, except as noted)

	Cents
Sponge Iron, domestic and foreign, 98% Fe, min. trucklots, freight allowed east of Mississippi River:	
100 mesh, bags	11.50
100 mesh, pails	9.85§
40 mesh, bags	8.10††
Electrolytic Iron,	
Melting stock, 99.87% Fe, irreg. fragments, ⅛ in. x 1.3 in.	28.75
(In contract lots of 240 tons price is 22.75c)	
Annealed, 99.5% Fe	36.75
Unannealed (99+% Fe)	33.25
Unannealed (99+% Fe) (minus 325 mesh)	58.25
Powder Flake (minus 16 plus 100 mesh)	29.25
Carbonyl Iron:	
98.1-98.9%, 3 to 20 microns, depending on grade, 93.00-290.00 in standard 200-lb containers; all minus 200 mesh.	
Aluminum:	
Atomized, 500-lb drum, freight allowed, c.l.	38.50; ton lots 40.50
Antimony, 500-lb lots	42.00*
Brass, 500-lb lots	35.70-52.20†
Bronze, 5000-lb lots	53.50-57.50†
Copper, electrolytic	14.25*
Copper, reduced	14.25*
Lead	7.50*
Manganese, Electrolytic: Minus 35 mesh	$1.00
Nickel	$1.15
Nickel-Silver, 5000-lb lots	54.00-58.30†
Phosphor-Copper, 5000-lb lots	66.00
Copper (atomized) 5000-lb lots	46.50-55.00
Solder	7.00*
Silicon	70.00*
Stainless Steel, 304	89.00*
Stainless Steel, 316	$1.07
Tin	14.00*
Zinc, 5000-lb lots	20.70-33.90‡

Tungsten:	Dollars
Carbon reduced, 98.8% min, minus 65 mesh	nom**
Chromium electrolytic 99.8% Cr, min, metallic basis	5.00

*Plus cost of metal. †Depending on composition. ‡Depending on mesh. §Cutting and scarfing grade. **Depending on price of ore. ††Welding grade.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, Pa., furnace	$14.75-15.25
Connellsville, Pa., foundry	18.00-18.50

Oven Foundry Coke

Birmingham, oven	$30.35
Cincinnati, deld.	33.34
Buffalo, ovens	32.00
Detroit, ovens	32.00
Pontiac, Mich., deld.	33.96
Saginaw, Mich., deld.	35.53
Erie, Pa., ovens	32.00
Everett, Mass., ovens: New England, deld.	33.55*
Indianapolis, ovens	31.25
Ironton, Ohio, ovens	30.50
Cincinnati, deld.	33.54
Kearny, N. J., ovens	31.25
Milwaukee, ovens	32.00
Neville Island (Pittsburgh), Pa., ovens	30.75
Painesville, Ohio, ovens	32.00
Cleveland, deld.	34.19
Philadelphia, ovens	31.00
St. Louis, ovens	33.00
St. Paul, ovens	31.25
Chicago, deld.	34.68
Swedeland, Pa., ovens	31.00
Terre Haute, Ind., ovens	31.25

*Within $5.15 freight zone from works.

Imported Steel

(Base per 100 lb, landed, duty paid; based on current ocean rates with any rise for buyer's acc't. Source of shipment: Western Europe)

	North Atlantic	Great Lakes*	South Atlantic	Gulf Coast	West Coast
Deformed Bars, Intermediate, ASTM-A 305	$6.75	....	$6.70	$6.60	$7.06
Bar Size Angles	6.45	....	6.40	6.30	6.76
Structural Angles	6.35	....	6.30	6.20	6.66
I-Beams	6.35	....	6.30	6.20	6.66
Channels	6.35	....	6.30	6.20	6.66
Plates (basic bessemer)	6.60	....	6.65	6.55	6.95
Sheets, H.R.	9.50	....	9.45	9.35	9.75
Sheets, Galvanized, 20 Ga., 36 in. x 96 in.	11.00	....	10.95	10.85	11.25
Sheets, Galv. (in coils) 20 Ga., 48 in. wide	11.00	....	10.95	10.81	11.25
Sheets, C.R. (drawing quality)	12.00	....	11.95	11.85	12.25
Furring Channels, C.R., 1000 ft, ¾ x 0.30 lb per ft	26.00	....	25.74	25.50	27.12
Barbed Wire (†)	8.25	....	8.20	8.10	8.50
Merchant Bars	6.45	....	6.40	6.30	6.76
Hot-Rolled Bands	9.50	....	9.45	9.35	9.75
Wire Rods, Thomas Commercial No. 5	6.60	....	6.45	6.45	6.70
Wire Rods, O. H.	7.05	....	6.90	6.90	7.15
Bright Common Wire Nails (§)	8.25	....	8.20	8.10	8.50

*Books closed for 1959-60 shipping season. †Per 82 lb net reel. §Per 100-lb keg, 20d nails and heavier.

Coal Chemicals

(Representative prices)

Cents per gal f.o.b. tank cars or tank trucks, plant.

Pure benzene	31.00
Xylene, industrial grade	29.00
Creosote	24.00
Naphthalene, 78 deg.	5.00
Toluene, one deg (deld. east of Rockies)	25.00

Cents per lb, f.o.b. tank cars or tank trucks, deld.

Phenol, 90 per cent grade	14.75

Per net ton bulk, f.o.b. cars or trucks, plant

Ammonium sulfate, regular grade	$32.00

Robinson Refractories Serve You Best!

No matter what your requirements, it pays to specify Robinson Refractories

- ★ Advanced production techniques
- ★ Modern manufacturing equipment
- ★ Rigid quality control
- ★ Field engineering service
- ★ 15 completely stocked branches
- ★ Fast, dependable delivery
- ★ Complete line for all your needs

New! Robinson Kiln Car and Floor Block. Write for Complete-Line Refractories Catalog.

THE ROBINSON CLAY PRODUCT CO. AKRON 9, OHIO

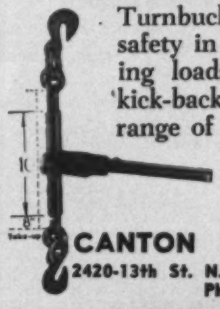
15 ROBINSON BRANCHES TO SERVE YOU BEST

AKRON, OHIO • ALBANY, N. Y. • BALTIMORE, MD. • BLOOMFIELD, N. J. • BOSTON, MASS. • BUFFALO, N. Y. • CHICAGO, ILL. • EAST HARTFORD, CONN. • INDIANAPOLIS, IND. • MT. VERNON, N. Y. • NEW YORK, N. Y. (JAMAICA, L. I.) • PHILADELPHIA, PA. (POTTSTOWN, PA.) • ROCHESTER, N. Y. • SYRACUSE, N. Y. • CONCORD, ONTARIO, CANADA

R-359-1368

Popular A F M Ratchet Type

Canton LOAD BINDERS



Turnbuckle principle gives complete safety in tightening, binding, releasing loads. One man operates; no kick-backs; full 8" take-up; wide range of application for this quality tool. Five sizes by the Nation's Binder Specialists. Prompt delivery.

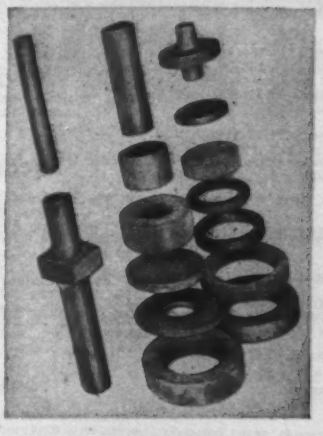
CANTON MANUFACTURING Co.
2420-13th St. N.E. Canton 5, Ohio
Phone GLendale 3-3614

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303H North 11th St. • St. Louis 6, Mo.

STRENGTH and ECONOMY ASSURED THROUGH FLAT-DIE FORGINGS!



Typical examples of flat die forgings.

Combining the time-proved advantages of forged strength, minimum stock allowance and versatility in materials selection, flat die forgings mean real savings and satisfaction — for experimental parts or short run production.

For prompt service, or our technical "know how," call or write:

COMPOSITE FORGINGS, INC.
2300 W. JEFFERSON, DETROIT 16, MICH.
Phone TAshmoo 5-3226

Ferroalloys

MANGANESE ALLOYS

Spiegeleisen: Carlot, per gross ton, Palmerton, Neville Island, Pa. 21-23% Mn, $105; 19-21% Mn, 1-3% Si, $102.50; 16-19% Mn, $100.50.

Standard Ferromanganese: (Mn 74-76%, C 7% approx) base price per net ton, $245. Johnstown, Duquesne, Sheridan, Neville Island, Pa.; Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Add or subtract $2 for each 1% or fraction thereof of contained manganese over 76% or under 74%, respectively (Mn 79-81%). Lump $253 per net ton, f.o.b. Anaconda or Great Falls, Mont. Add $2.60 for each 1% above 81%; subtract $2.60 for each 1% below 79%, fractions in proportion to nearest 0.1%.

High-Grade Low-Carbon Ferromanganese: (Mn 85-95%). Carload, lump, bulk, max 0.07% C, 35.1c per lb of contained Mn, carload packed 36.4c, ton lots 37.9c, less ton 39.1c. Delivered. Deduct 1.5c for max 0.15% C grade from above prices, 3c for max 0.03% C, 5.5c for max 0.5% C, and 6.5c for max 75% C—max 7% Si. **Special Grade:** (Mn 90% min, C 0.07% max, P 0.06% max). Add 2.05c to the above prices. Spot, add 0.25c.

Medium-Carbon Ferromanganese: (Mn 80-85%, C 1.25-1.5%, Si 1.5% max). Carload, lump, bulk, 25.5c per lb of contained Mn; packed, carload 26.8c, ton lot 28.4c, less ton 29.6c.

Electrolytic Manganese Metal: Mn carload, bulk, 34.25c; 2000 lb to min carload 37c; less ton, 39c; 50 lb cans, add 0.5c per lb. Premium for hydrogen-removed metal 0.75c per lb. Prices are f.o.b. cars, Knoxville, Tenn., freight allowed to St. Louis or any point east of Mississippi River; or f.o.b. Marietta, O., freight allowed.

Silicomanganese: (Mn 65-68%). Carload, lump, bulk, 1.50% C grade, 18.5-21% Si, 12.8c per lb of alloy. Packed, c.l. 14c, ton 14.45c, less ton 15.45c, f.o.b. Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. For 2% C grade, Si 16-18.5%, deduct 0.2c from above prices. For 3% grade, Si 12.5-16%, deduct 0.4c from above prices. Spot, add 0.25c.

TITANIUM ALLOYS

Ferrotitanium, Low-Carbon: (Ti 20-25%, Al 3.5% max, Si 4% max, C 0.10% max). Contract, ton lot, 2" x D, $1.50 per lb of contained Ti; less ton to 300 lb, $1.55. (Ti 38-43%, Al 8% max, Si 4% max, C 0.10% max). Ton lot $1.35, less ton to 300 lb $1.37, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

Ferrotitanium, High-Carbon: (Ti 15-18%, C 6-8%). Contract min c.l. $250 per ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi River and north of Baltimore and St. Louis. Spot, $255.

Ferrotitanium, Medium-Carbon: (Ti 17-21%, C 2-4%). Contract, c.l. $300 per ton, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed. Spot, $305.

CHROMIUM ALLOYS

High-Carbon Ferrochrome: C.l. lump, bulk, 28.75c per lb of contained Cr. Delivered.

Charge Chrome 1: Cr 63%, C 6% max, Si 7% max, 22c. **Charge Chrome 2:** Cr 50-59%, C 8% max, Si 6% max, 23c. Carload, lump, bulk, per lb Cr.

Refined Chrome 1: Cr 50-59%, C 5% max, Si 2% max, 25c. **Refined Chrome 2:** Si 12% max, 24c. Carload, lump, bulk, per lb Cr.

Low-Carbon Ferrochrome: Cr 63-66% (Simplex), carload, lump, bulk, C 0.025% max, 36.75c per lb contained Cr; 0.010% max, 37.75c. Delivered.

Cr 67-71%, carload, lump, bulk, 0.025% max, 39.75c; 0.05% max, 39.00c; 0.10% max, 38.50c; 0.20% max, 38.25c; 0.50% max, 38.00c; 1.0% max, 37.75c; 1.5% max, 37.50c; 2.0% max, 37.25c. Delivered.

Foundry Ferrochrome, High-Carbon: (Cr 62-66%, C 5-7%, Si 7-10%). C.l., 2" x D, bulk 30.8c per lb of contained Cr. Packed, c.l. 32.4c, ton 34.2c, less ton 35.7c. Delivered. Spot, add 0.25c.

Foundry Ferrosilicon Chrome: (Cr 50-54%, Si 28-32%, C 1.25% max). SM x D, carload, bulk, 20.05c per lb of alloy, carload packed, 21.25c, ton lot 22.50c, less ton lot 23.70c. Delivered. Spot, add 0.25c.

Ferrochrome-Silicon: Cr 39-41%, Si 42-45%, C 0.05% max or Cr 33-36%, Si 45-48%, C 0.05% max. Carload, lump, bulk, 3" x down and 2" x down, 28.25c per lb contained Cr, 14.60c per lb contained Si, 0.75" x down 29.40c per lb contained Cr, 14.60c per lb contained Si.

Chromium Metal, Electrolytic: Commercial grade (C 99.8% min, metallic basis, Fe 0.2% max). Contract, carlot, packed, 2" x D plate (about ¼" thick) $1.15 per lb, ton lot $1.17, less ton lot $1.19. Delivered. Spot, add 5c.

VANADIUM ALLOYS

Ferrovanadium: Open hearth grade (V 50-55%, Si 8% max, C 3% max). Contract, any quantity, $3.20 per lb of contained V. Delivered. Spot, add 10c. **Special Grade:** (V 50-55% or 70-75%, Si 2% max, C 0.5% max) $3.30. **High Speed Grade:** (V 50-55% or 70-75%, Si 1.50% max, C 0.20% max) $3.40.

Grainal: Vanadium Grainal No. 1 $1.05 per lb; No. 79, 50c, freight allowed.

Vanadium Oxide: Contract, less carload lot, packed, $1.38 per lb contained V_2O_5, freight allowed. Spot, add 5c.

SILICON ALLOYS

50% Ferrosilicon: Carload, lump, bulk, 14.6c per lb contained Si. Packed, c.l. 17.1c, ton lot 18.55c, less ton 20.20c, f.o.b. Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Keokuk, Iowa; Portland, Oreg. Spot, add 0.45c.

Low-Aluminum 50% Ferrosilicon: (Al 0.40% max). Add 1.45c to 50% ferrosilicon prices.

65% Ferrosilicon: Carload, lump, bulk, 15.75c per lb contained silicon. Packed, c.l. 17.75c, ton lot 19.55c, less ton 20.9c. Delivered. Spot, add 0.35c.

75% Ferrosilicon: Carload, lump, bulk, 16.9c per lb of contained Si. Packed, c.l. 18.8c, ton lot 20.45c, less ton 21.7c. Delivered. Spot, add 0.3c.

90% Ferrosilicon: Carload, lump, bulk, 20c per lb of contained Si. Packed, c.l. 21.65c, ton lot 23.05c, less ton 24.1c. Delivered. Spot, add 0.25c.

Silicon Metal: (98% min Si, 1.00% max Fe, 0.07% max Ca). C.l. lump, bulk, 21.5c per lb of Si. Packed, c.l. 23.15c, ton lot 24.45c, less ton 25.45c. Add 0.5c for max 0.03% Ca grade. Add 0.5c for 0.50% Fe grade analyzing 98.25% min Si.

Alsifer: (Approx 20% Al, 40% Si, 40% Fe). Contract, basis f.o.b. Niagara Falls, N. Y., lump, carload, bulk, 9.85c per lb of alloy; ton lot, packed, 10.85c.

ZIRCONIUM ALLOYS

12-15% Zirconium Alloy: (Zr 12-15%, Si 39-43%, C 0.20% max). Contract, c.l., lump, bulk, 9.25c per lb of alloy. Packed, c.l. 10.45c, ton lots 11.6c, less ton 12.45c. Delivered. Spot, add 0.25c.

35-40% Zirconium Alloy: (Zr 35-40%, Si 47-52%, Fe 8-12%, C 0.50% max). Carload, bulk 26.25c per lb of alloy, carload, lump, packed 27.25c, ton lot 28.4c, less ton 29.65c. Freight allowed. Spot, add 0.25c.

BORON ALLOYS

Ferroboron: 100 lb or more packed (B 17.50% min, Si 1.50% max, Al 0.50% max, C 0.50% max). Contract, 100 lb or more 1" x D, $1.20 per lb of alloy; less than 100 lb $1.30. Delivered. Spot, add 5c. F.o.b. Washington, Pa., prices, 100 lb and over are as follows: Grade A (10-14% B) 85c per lb; Grade B (14-18% B) $1.20; Grade C (19% min B) $1.50.

Borosil: (3 to 4% B, 40 to 45% Si). Carload, bulk, lump, or 3" x D, $5.25 per lb of contained B. Packed, carload $5.40, ton to c.l. $5.50, less ton $5.60. Delivered.

Carbortam: (B 1 to 2%). Lump, carload $320 per ton, f.o.b. Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

CALCIUM ALLOYS

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%). Carload, lump, bulk 23c per lb of alloy, carload packed 24.25c, ton lot 26.15c, less ton 27.15c. Delivered. Spot, add 0.25c.

Calcium-Silicon: (Ca 30-33%, Si 60-65%, Fe 1.5-3%). Carload, lump, bulk 24c per lb of alloy, carload packed 25.65c, ton lot 27.95c, less ton 29.45c. Delivered. Spot, add 0.25c.

BRIQUETTED ALLOYS

Chromium Briquets: (Weighing approx 3½ lb each and containing 2 lb of Cr). Carload, bulk 19.60c per lb of briquet, in bags 20.70c; 3000 lb to c.l. pallets 20.80c; 2000 lb to c.l. in bags 21.90c; less than 2000 lb in bags 22.80c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx 3 lb and containing 2 lb of Mn). Carload, bulk 14.8c per lb of briquet; c.l., packed, bags 16c; 3000 lb to c.l., pallets 16c; 2000 lb to c.l., bags 17.2c; less ton 18.1c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicomanganese Briquets: (Weighing approx 3½ lb and containing 2 lb of Mn and approx ½ lb of Si). C.l. bulk 15.1c per lb of briquet; c.l. packed, bags 16.3c; 3000 lb to c.l., pallets 16.3c; 2000 lb to c.l., bags 17.5c; less ton 18.4c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx 5 lb and containing 2 lb of Si and small sizes, weighing approx 2½ lb and containing 1 lb of Si). Carload, bulk 8c per lb of briquet; packed, bags 9.2c; 3000 lb to c.l., pallets 9.6c; 2000 lb to c.l., bags 10.8c; less ton 11.7c. Delivered. Spot, add 0.25c.

Molybdic-Oxide Briquets: (Containing 2½ lb of Mo each). $1.49 per lb of Mo contained, f.o.b. Langeloth, Pa.

Titanium Briquets: Ti 98.27%, $1 per lb f.o.b. Niagara Falls, N. Y.

TUNGSTEN ALLOYS

Ferrotungsten: (70-80%). 5000 lb W or more $2.15 per lb (nominal) of contained W. Delivered.

OTHER FERROALLOYS

Ferrocolumbium: (Cb 50-60%, Si 8% max, C 0.1% max). Ton lots 2" x D, $3.45 per lb of contained Cb; less ton lots $3.50 (nominal). Delivered.

Ferrotantalum Columbium: (Cb 40% approx, Ta 20% approx, and Cb plus Ta 60% min, C 0.30% max). Ton lots 2" x D, $3.05 per lb of contained Cb plus Ta, delivered; less ton lots $3.10.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7%, Fe 20% approx). Carlot bulk 19.25c per lb of alloy, c.l. packed ½ in. x 12 M 20.00c, ton lot 21.15c, less ton 22.40c. Delivered. Spot, add 0.25c.

Graphidox No. 4: (Si 48-52%, Ca 5-7%, Ti 9-11%). C.l. packed, 20c per lb of alloy, ton lot 21.15c; less ton lot 22.4c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19%, Mn 8-11%). C.l. packed 18.45c per lb of alloy; ton lot 19.95c; less ton lot 21.20c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

Simanal: (Approx 20% each Si, Mn, Al; bal Fe). Lump, carload, bulk 19.25c. Packed c.l. 20.25c, 2000 lb to c.l. 21.25c; less than 2000 lb 21.75c per lb of alloy. Delivered.

Ferrophosphorus: (23-25% based on 24% P content with unitage of $5 for each 1% of P above or below the base). Carload, bulk, f.o.b. sellers' works, Mt. Pleasant, Siglo, Tenn., $120 per gross ton.

Ferromolybdenum: (55-75%). Per lb of contained Mo in 200-lb container, f.o.b. Langeloth and Washington, Pa., $1.76 in all sizes except powdered which is $1.82.

Technical Molybdic-Oxide: Per lb of contained Mo, in cans, $1.47; in bags, $1.46, f.o.b. Langeloth and Washington, Pa.

(*Concluded from Page* 386)

Shipments of standard structurals are not too extended, running about 10 to 12 weeks, but deliveries of wide flange sections run 17 to 21 weeks. Plates can be had in 12 to 13 weeks.

The third quarter backlog of unshipped tonnage in standard structurals will be cleared up this month, a Pittsburgh producer predicts. Wide flange beams won't be current until February.

District fabricators are complaining about conflicting reports from the mills. One says: "We got different stories from two individuals at the same mill. One said that we would be on allocation until further notice. Another told us we could have all the steel we might need in the second quarter."

Eastern and New England fabricators say they are making some progress on order backlogs. Fabricating cycles are more orderly as steel stocks become better balanced. Resumption of the work stoppage at the mills will quickly throw fabricating schedules out of whack.

More work is coming out for estimates in New England. Bridge tonnage is heavier for first quarter.

Inland Barge Traffic In October Off '58 Pace

Common carrier barge traffic in October continued substantially below the level of a year ago, reports the Inland Waterways Common Carriers Association, composed of the leading common carrier barge lines on the Mississippi, Missouri, and Ohio Rivers, and their tributaries and the Gulf Intracoastal Canal.

A 17.1 per cent drop in barge tonnage, a 3.9 per cent drop in barges loaded, and a decline of 39.2 per cent in gross freight revenues were reported. Factors contributing to the decline was the steel strike and a labor dispute which hampered operations of several member companies.

The October statistics were: Barges loaded, 2997 vs. 2544 in October, 1958; gross freight revenues, $4,587,593 vs. $7,545,941; tons transported, 3,071,160 vs. 3,706,866.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PENDING

3400 tons, hangars and buildings, Andrews Air Force Base, Md., two contracts; bids in.

Unstated, Washington State child treatment center; Merritt Construction Co., Tacoma, Wash., low at $528,989.

Unstated, missile assembly building, Fairchild Air Field, Spokane, Wash., Swanson & Youngdahl, Minneapolis, low at $1,148,263 to the U. S. Engineer, Seattle.

Unstated, two draft tube gates, Rocky Reach Dam, Wenatchee, Wash., bids Jan. 16; Stone & Webster, Seattle, engineer.

Unstated, additional inspection facilities, Hanford Works, Washington State; heavy steel shielding involved; W. G. Clark Construction Co., Seattle, low at $406,000 to Atomic Energy Commission.

REINFORCING BARS . . .

REINFORCING BARS PENDING

50 tons, also miscellaneous, two 120 ft spans, Lane County, Oregon; bids to the Bureau of Public Roads, Portland, Oreg., Jan. 12.

Unstated, Burbank grain terminal, Walla Walla, Wash.; E. R. Haynes, Spokane, Wash., general contractor.

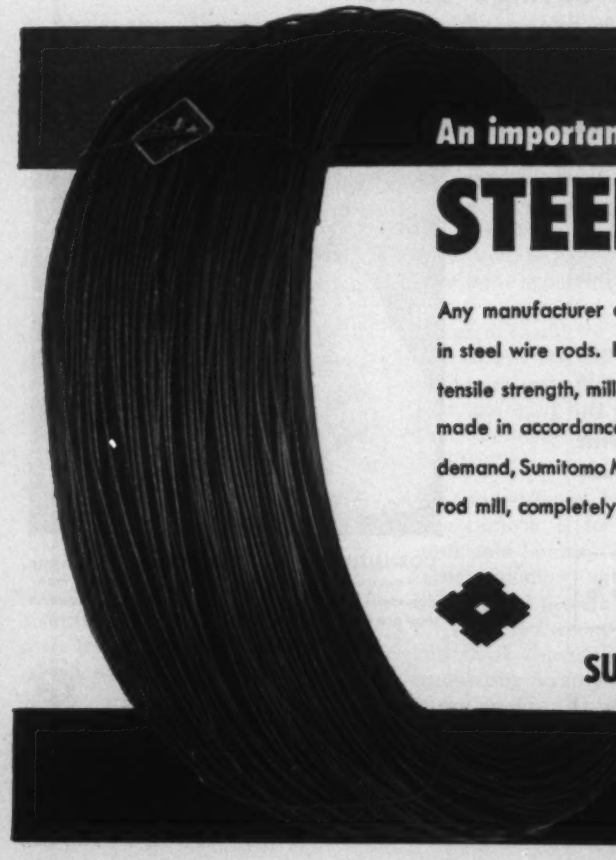
Unstated, Oregon State highway awards: Jackson County, Rogue River bridges, to Pacific Concrete Co. and O. P. Jordan Jr., Portland, Oreg., joint low at $623,333; Josephine and Jackson counties, Ausland Construction Co., Grants Pass, two awards for bridges, at $24,550 and $95,585.

PLATES . . .

PLATES PENDING

227 tons, carbon, General Stores Supply Office, Navy, Philadelphia; bids Jan. 5.

100 tons, carbon, 1½ in. thick, Rock Island Arsenal, Ill., bids Jan. 4.



An important message for the man who buys

STEEL WIRE RODS

Any manufacturer of nail, wire mesh or barbed wire looks first for quality in steel wire rods. For rods that are uniform in size and of the specified tensile strength, mill owners have learned to rely on Sumitomo's wire rods, made in accordance with strictest standards. To keep up with this export demand, Sumitomo Metal has added to its present facilities another new wire rod mill, completely equipped with the most modern machinery available.

LEADING PRODUCERS OF STEEL WIRE RODS, PIPE AND ROLLING STOCK PARTS

SUMITOMO METAL INDUSTRIES, LTD.

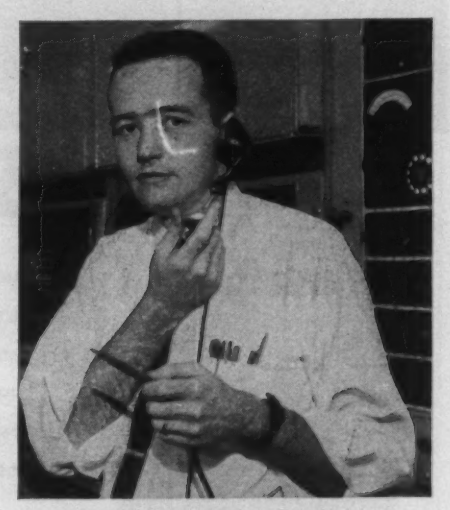
HEAD OFFICE: OSAKA, JAPAN
CABLE ADDRESS: "SUMITOMOMETAL OSAKA"

THE U.S. TREASURY SALUTES THE PAYROLL SAVERS

—who help strengthen America's Peace Power by buying U.S. Savings Bonds

In America's major industries, and in thousands of companies, large and small, patriotic Americans are making regular purchases of Shares in America through the Payroll Savings Plan. These devoted citizens are helping themselves and their families as well as giving dollar support to the Peace Power of our country. The Payroll Savings Plan provides a sound, systematic way to help finance homes and education and increase security after retirement, and it builds our country's economic strength.

Has your company put in the Payroll Savings Plan? If not, start now! Or, perhaps you want to increase participation in an existing Plan? Just contact your State Savings Bonds Director and he will gladly help put this Plan to work. Or write Savings Bonds Division, U. S. Treasury Department, Washington 25, D. C.



CORNELIUS J. MANNING, skilled technician in one of America's communication centers, is typical of many thousands of payroll savers in industry and business who are buying U. S. Savings Bonds regularly.

NOW! U.S. SAVINGS BONDS EARN 3¾%

STEEL
The Metalworking Weekly

THE U. S. GOVERNMENT DOES NOT PAY FOR THIS ADVERTISEMENT. THE TREASURY DEPARTMENT THANKS, FOR THEIR PATRIOTISM, THE ADVERTISING COUNCIL AND THE DONOR ABOVE.

Scrapmen Optimistic for 1960

Brokers and dealers anticipate substantial improvement in demand from mills and foundries. Market was hard hit by the lengthy 1959 strike and prices slipped

Scrap Prices, Page 402

● **Washington**—Scrapmen expect to ship an estimated 32 million to 34 million gross tons of material this year. (Markets: Steel mills, foundries, and exports.) Domestic demand will run in the neighborhood of 30 million tons vs. 24 million in 1959, says E. C. Barringer, executive vice president, Institute of Scrap Iron & Steel Inc.

Last year the industry was hard hit by the lengthy steel strike. It's estimated that the industry could have sold 6 to 8 million additional tons had there been no work stoppage.

The impact of the strike was eased by heavy consumption at mills that continued to operate and by strong demand from foundries.

Of the supply of purchased scrap made available for domestic consumption and export last year, the institute estimates that 9.5 million gross tons originated at metalworking plants, including the auto industry.

● **Pittsburgh**—Dealers are looking for the traditional January rally and are hoping for record consumption of scrap this year. Reasons: 1. Steel industry spokesmen predict that ingot production will reach an all-time high of 130 million net tons. 2. Steelmakers may have to use an abnormally high percentage of scrap in their melts because of ore shortages, particularly in the spring.

Until a new labor contract is signed, eliminating the threat of another work stoppage, relatively little scrap buying will be done here. The mills apparently regard current prices as attractive, but dealers are reluctant to sell. A broker's willingness to buy low phos material from dealers at only 50 cents a ton less than the mills are paying indicates that the near term prospects are bullish.

● **Detroit**—Scrap is accumulating. The outlook is for a soft market until mid-January when the steel labor situation will be clarified. Brokers and dealers are more hopeful of a settlement of the dispute and think the mills will begin accumulating scrap about the middle of the month. At present prices are unchanged but largely nominal.

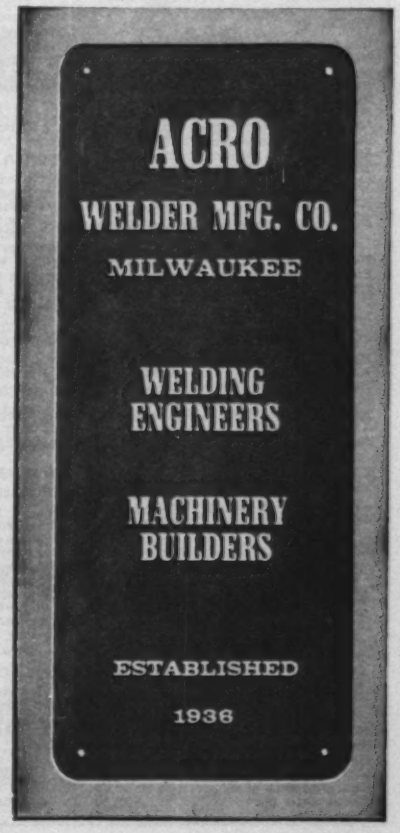
● **Cleveland**—Brokers and dealers say the immediate future trend of the market will hinge on monthend bids on the automotive lists. Virtually no buying of consequence was reported over the holidays. As a result, prices are unchanged and largely nominal. Surprisingly, there has been little demand for No. 1 heavy melting steel here or in the Valley since the mills resumed operations early in November. The low level of mill buying has consisted largely of bundles.

● **Philadelphia** — Scrap prices are unchanged, but the market is a little more optimistic. The extent of fluctuations over the next few weeks will depend upon developments in the steel labor negotiations.

● **New York**—Brokers' buying prices are steady. More activity in the market is expected this week, particularly if it appears a settlement of the steel wage dispute will be reached before the Taft-Hartley injunction expires late this month.

● **Chicago**—Buying was negligible over the holiday at previous prices. Observers see little improvement in demand for the steelmaking grades

(*Please turn to Page* 407)



Iron and Steel Scrap

Consumer prices per gross ton, except as otherwise noted, including broker's commission, as reported to STEEL, Dec. 30, 1959. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Dec. 30	$41.33
Dec. 23	41.33
Nov. Avg.	44.33
Dec. 1958	39.47
Dec. 1954	32.58

Based on No. 1 heavy melting grade at Pittsburgh, Chicago, and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	41.00-42.00
No. 2 heavy melting	35.00-36.00
No. 1 dealer bundles	42.00-43.00
No. 2 bundles	30.00-31.00
No. 1 busheling	41.00-42.00
No. 1 factory bundles	51.00-52.00
Machine shop turnings	22.00-23.00
Mixed borings, turnings	22.00-23.00
Shovel turnings	32.00-33.00
Cast iron borings	32.00-33.00
Cut structurals:	
2 ft and under	49.00-50.00
3 ft and under	48.00-49.00
Heavy turnings	35.00-36.00
Punchings & plate scrap	54.00-55.00
Electric furnace bundles	52.00-53.00

Cast Iron Grades

No. 1 cupola	50.00-51.00
Stove plate	46.00-47.00
Unstripped motor blocks	32.00-33.00
Clean auto cast	47.00-48.00
Drop broken machinery	54.00-55.00

Railroad Scrap

No. 1 R. R. heavy melt	51.00-52.00
Rails, 2 ft and under	66.00-67.00
Rails, 18 in. and under	65.00-66.00
Random rails	61.00-62.00
Angles, splice bars	56.00-57.00
Railroad specialties	58.00-59.00
Rails, rerolling	66.00-67.00

Stainless Steel Scrap

18-8 bundles & solids	230.00-235.00
18-8 turnings	120.00-125.00
430 bundles & solids	125.00-130.00
430 turnings	55.00-65.00

CHICAGO

No. 1 hvy melt., indus	41.00-42.00
No. 1 hvy melt., dealer	39.00-40.00
No. 2 hvy melting	*34.00-35.00*
No. 1 factory bundles	44.00-45.00
No. 1 dealer bundles	40.00-41.00
No. 2 bundles	25.00-27.00
No. 1 busheling, indus.	43.00-44.00
No. 1 busheling, dealer	40.00-41.00
Machine shop turnings	22.00-23.00
Mixed borings, turnings	24.00-25.00
Shovel turnings	24.00-25.00
Cast iron borings	24.00-25.00
Cut structurals, 3 ft	48.00-49.00
Punchings & plate scrap	50.00-51.00

Cast Iron Grades

No. 1 cupola	54.00-55.00
Stove plate	48.00-49.00
Unstripped motor blocks	46.00-47.00
Clean auto cast	60.00-61.00
Drop broken machinery	60.00-61.00

Railroad Scrap

No. 1 R.R. heavy melt.	44.00-45.00
R.R. malleable	62.00-63.00
Rails, 2 ft and under	59.00-60.00
Rails, 18 in. and under	60.00-61.00
Angles, splice bars	54.00-55.00
Axles	58.00-60.00
Rails, rerolling	61.00-62.00

Stainless Steel Scrap

18-8 bundles, solids	220.00-225.00
18-8 turnings	115.00-120.00
430 bundles & solids	115.00-120.00
430 turnings	55.00-60.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	35.00-36.00
No. 2 heavy melting	24.00-25.00
No. 1 bundles	37.00-38.00
No. 2 bundles	22.00-23.00
No. 1 busheling	34.00-35.00
Machine shop turnings	12.00-13.00
Mixed borings, turnings	13.00-14.00
Shovel turnings	14.00-15.00

Cast Iron Grades

No. 1 cupola	45.00-46.00
Stove plate	39.00-40.00
Heavy breakable	39.00-40.00
Unstripped motor blocks	31.00-32.00
Charging box cast	39.00-40.00
Clean auto cast	52.00-53.00

CLEVELAND

No. 1 heavy melting	40.00-41.00
No. 2 heavy melting	33.00-34.00
No. 1 factory bundles	46.00-47.00
No. 1 bundles	42.00-43.00
No. 2 bundles	26.00-27.00
No. 1 busheling	44.00-45.00
Machine shop turnings	16.00-17.00
Shovel turnings	22.00-23.00
Mixed borings, turnings	22.00-23.00
Cast iron borings	22.00-23.00
Cut foundry steel	42.00-43.00
Cut structurals, plate 2 ft and under	49.00-50.00
Low phos. punchings & plate	45.00-46.00
Alloy free, short shovel turnings	23.00-24.00
Electric furnace bundles	46.00-47.00

Cast Iron Grades

No. 1 cupola	55.00-56.00
Charging box cast	43.00-44.00
Heavy breakable cast	41.00-42.00
Stove plate	49.00-50.00
Unstripped motor blocks	39.00-40.00
Brake shoes	39.00-40.00
Clean auto cast	58.00-59.00
Burnt cast	47.00-48.00
Drop broken machinery	58.00-59.00

Railroad Scrap

R.R. malleable	64.00-65.00
Rails, 2 ft and under	65.00-66.00
Rails, 18 in. and under	66.00-67.00
Rails, random lengths	59.00-60.00
Cast steel	53.00-54.00
No. 1 railroad cast	58.50-59.50
Railroad specialties	57.00-58.00
Angles, splice bars	57.00-58.00
Rails, rerolling	74.00-75.00

Stainless Steel (Brokers' buying prices: f.o.b. shipping point)

18-8 bundles, solids	210.00-215.00
18-8 turnings	110.00-115.00
430 clips, bundles, solids	115.00-120.00
430 turnings	45.00-55.00

YOUNGSTOWN

No. 1 heavy melting	43.00-44.00
No. 2 heavy melting	36.00-37.00
No. 1 busheling	47.00-48.00
No. 1 bundles	45.00-46.00
No. 2 bundles	29.00-30.00
Machine shop turnings	18.00-19.00
Shovel turnings	23.00-24.00
Cast iron borings	23.00-24.00
Low phos.	48.00-49.00
Electric furnace bundles	48.00-49.00

Railroad Scrap

No. 1 R.R. heavy melt.	46.00-47.00

BUFFALO

No. 1 heavy melting	37.00-38.00
No. 2 heavy melting	33.00-34.00
No. 1 bundles	37.00-38.00
No. 2 bundles	27.00-28.00
No. 1 busheling	37.00-38.00
Shovel turnings	24.00-25.00
Machine shop turnings	20.00-21.00
Cast iron borings	22.00-23.00
Low phos structurals and plate, 2 ft and under	45.00-46.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	47.00-48.00
No. 1 machinery	51.00-52.00

Railroad Scrap

Rails, random lengths	47.00-48.00
Rails, 3 ft and under	53.00-54.00
Railroad specialties	45.00-46.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	30.50-31.50
No. 1 bundles	36.00-37.00
No. 2 bundles	25.00-26.00
No. 1 busheling	36.00-37.00
Machine shop turnings	20.00-21.00
Mixed borings, turnings	20.00-21.00
Shovel turnings	22.00-23.00
Cast iron borings	21.00-22.00
Low phos 18 in.	49.00-50.00

Cast Iron Grades

No. 1 cupola	49.00-50.00
Heavy breakable cast	44.00-45.00
Charging box cast	44.00-45.00
Drop broken machinery	59.00-60.00

Railroad Scrap

No. 1 R. R. heavy melt.	44.00-45.00
Rails, 18 in. and under	63.00-64.00
Rails, random lengths	54.00-55.00

PHILADELPHIA

No. 1 heavy melting	42.00
No. 2 heavy melting	35.00
No. 1 bundles	46.00
No. 2 bundles	26.00
No. 1 busheling	46.00
Electric furnace bundles	49.00
Mixed borings, turnings	21.00-22.00†
Shovel turnings	27.00
Machine shop turnings	23.00
Heavy turnings	35.00†
Structurals & plates	49.00-51.00
Couplers, springs, wheels	51.00
Rail crops, 2 ft & under	66.00-68.00

Cast Iron Grades

No. 1 cupola	45.00
Heavy breakable cast	47.00
Drop broken machinery	54.00-55.00
Malleable	68.00

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	32.00-33.00
No. 1 bundles	36.00-37.00
No. 2 bundles	20.00-21.00
Machine shop turnings	11.00-12.00
Mixed borings, turnings	14.00-15.00
Shovel turnings	15.00-16.00
Low phos. structurals & plates	39.00-40.00

Cast Iron Grades

No 1 cupola	38.00-39.00
Unstripped motor blocks	25.00-26.00
Heavy breakable	37.00-38.00

Stainless Steel

18-8 sheets, clips, solids	200.00-205.00
18-8 borings, turnings	85.00-90.00
410 sheets, clips, solids	55.00-60.00
430 sheets, clips, solids	85.00-90.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	35.00-36.00
No. 2 heavy melting	25.50-26.50
No. 1 bundles	35.00-36.00
No. 1 busheling	35.00-36.00
Machine shop turnings	11.00-12.00
Shovel turnings	15.00-16.00
No. 1 cast	39.00-40.00
Mixed cupola cast	37.00-38.00
No. 1 machinery cast	40.00-43.00

BIRMINGHAM

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	31.00-32.00
No. 1 bundles	36.00-37.00
No. 2 bundles	24.00-25.00
No. 1 busheling	40.00-41.00
Cast iron borings	14.00-15.00
Machine shop turnings	23.00-24.00
Shovel turnings	25.00-26.00
Bar crops and plate	44.00-45.00
Structurals & plates	43.00-44.00
Electric furnace bundles	40.00-41.00
Electric furnace:	
3 ft and under	39.00-40.00
2 ft and under	38.00-39.00

Cast Iron Grades

No. 1 cupola	53.00-54.00
Stove plate	53.00-54.00
Charging box cast	29.00-30.00
Unstripped motor blocks	42.00-43.00
No. 1 wheels	44.00-45.00

Railroad Scrap

No. 1 R.R. heavy melt.	36.00-37.00
Rails, 18 in. and under	56.00-57.00
Rails, rerolling	61.00-62.00
Rails, random lengths	52.00-53.00
Angles, splice bars	49.00-50.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	35.00-37.00
No. 2 heavy melting	33.00-34.00
No. 1 bundles	42.00
No. 2 bundles	25.00
No. 1 busheling	42.00
Machine shop turnings	19.00
Shovel turnings	21.00

Cast Iron Grades

No. 1 cupola	53.00
Charging box cast	46.00
Heavy breakable cast	44.00
Unstripped motor blocks	45.00
Clean auto cast	56.00
Stove plate	45.00

Railroad Scrap

No. 1 R.R. heavy melt.	45.00
Rails, 18 in. and under	56.00
Rails, random lengths	50.00
Rails, rerolling	65.00
Angles, splice bars	50.00

HOUSTON

(Exporters' buying prices; f.a.s.)

No. 1 heavy melting	*36.00-37.00*
No. 2 heavy melting	*34.00*
No. 2 bundles	26.50-27.50

(Brokers' buying prices; f.o.b. cars)

No. 1 heavy melting	34.00†
No. 2 heavy melting	31.00†
No. 1 bundles	34.00
No. 2 bundles	20.00†
Machine shop turnings	17.00
Shovel turnings	20.00
Low phos, plates & structurals	48.00

Cast Iron Grades

No. 1 cupola	47.00
Heavy breakable	35.00
Foundry malleable	43.00-44.00
Unstripped motor blocks	38.50-39.50

Railroad Scrap

No. 1 R.R. heavy melt.	38.00-39.00

LOS ANGELES

(Brokers' buying prices)

No. 1 heavy melting	40.00
No. 2 heavy melting	*38.00*
No. 1 bundles	37.00
No. 2 bundles	21.00
Machine shop turnings	18.00
Shovel turnings	18.00
Cast iron borings	18.00
Cut structurals and plate 1 ft and under	48.00

Cast Iron Grades

No. 1 cupola	47.00

Railroad Scrap

No. 1 R.R. heavy melt.	39.00

PORTLAND, OREG.

(Brokers' buying prices)

No. 1 heavy melting	40.00-41.00
No. 2 heavy melting	36.00-38.00
No. 1 bundles	36.00
No. 2 bundles	25.00-26.00
Shovel turnings	22.00
Electric furnace bundles	42.00-44.00

Cast Iron Grades

No. 1 cupola	40.00-42.00
Heavy breakable	35.00
Unstripped motor blocks	31.00
Stove plate	21.00

SEATTLE

No. 1 heavy melting	35.00†
No. 2 heavy melting	32.00-33.00
No. 1 bundles	32.00-33.00
No. 2 bundles	22.00†
Machine shop turnings	17.00†
Mixed borings, turnings	17.00†
Electric furnace No. 1	42.00-43.00

Cast Iron Grades

No. 1 cupola	34.00†
Heavy breakable cast	28.00†
Unstripped motor blocks	26.00†
Stove plate (f.o.b. plant)	21.00†

SAN FRANCISCO

No. 1 heavy melting	40.00
No. 2 heavy melting	36.00
No. 1 bundles	36.00
No. 2 bundles	22.00
Machine shop turnings	16.00
Mixed borings, turnings	16.00
Cast iron borings	16.00
Heavy turnings	16.00
Shovel turnings	16.00
Cut structurals, 3 ft	44.00

Cast Iron Grades

No. 1 cupola	48.00
Charging box cast	34.00
Stove plate	34.00
Heavy breakable cast	28.00
Unstripped motor blocks	31.00
Clean auto cast	40.00
Drop broken machinery	40.00
No. 1 wheels	34.00

HAMILTON, ONT.

(Brokers' buying prices)

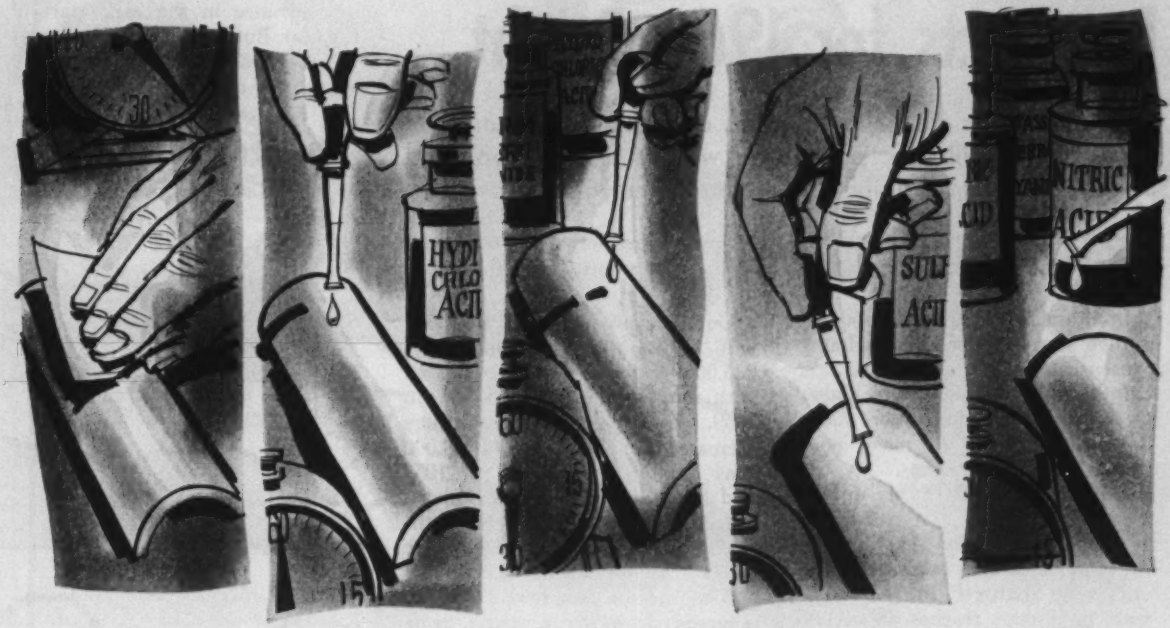
No. 1 heavy melting	32.25
No. 2 heavy melting	28.25
No. 1 bundles	32.25
No. 2 bundles	24.00
Mixed steel scrap	24.25
Mixed borings, turnings	13.00
Busheling, new factory:	
Prepared	32.25
Unprepared	26.25
Shovel turnings	17.00

Cast Iron Grades‡

No. 1 machinery cast	46.50-48.00

*Delivered to docks.
†Nominal.
‡F.o.b. Hamilton, Ont.

S-E-G-R-E-G-A-T-E-D SCRAP IS WORTH MORE



Be sure surface of specimen is clean. Add 1 drop of 10 percent hydrochloric acid; allow 1 minute reaction time. Add 1 drop of ten percent potassium ferricyanide; after 30 seconds, if dark green to blue drop appears, the sample belongs to iron alloy group. Add a drop of concentrated sulphuric acid. If there is only a slight reaction or none at all, add a drop of 1:1 nitric acid and at the end of 15 seconds, if there is a vigorous reaction, the specimen is probably Type 1 Ni-Resist Iron. It is well to have a known specimen as a standard for comparison.

Here is how to test for
TYPE 1 NI-RESIST IRON

This nickel-copper cast alloy, first introduced in 1927, is important because of its corrosion, erosion and wear resistant properties. Being non-magnetic, there are many applications where this characteristic is advantageous.

Since it can withstand the destructive effects of sea water over a long period of time, it is frequently used in marine installations. The chemical and petroleum industries also find it desirable because of its ability to endure high temperatures as well as resist the unusual corrosive conditions caused by the handling of acids, alkalies and salts.

One of the more interesting services which Type 1 Ni-Resist iron performs is found in the pulp and paper industry. Since freedom from rust or iron pick-up is essential, it is used for press rolls, caustic handling equipment and valves on stock lines.

Because of its copper content, Type 1 Ni-Resist iron should be kept separate from other alloy scrap. For scrap of known analysis, our personnel, equipment and strategically located facilities are specifically geared for the purchase or sale of dependably segregated metals. We welcome your inquiry.

Luria Brothers and Company, Inc.

MAIN OFFICE • Chrysler Building East, New York 17, N.Y.

BRANCH OFFICES • BIRMINGHAM, ALA. • BOSTON, MASS. • BUFFALO, N.Y. • CHICAGO, ILLINOIS • CINCINNATI, OHIO • CLEVELAND, OHIO • DETROIT, MICHIGAN • HOUSTON, TEXAS • KOKOMO, INDIANA • LOS ANGELES, CAL. • MEMPHIS, TENN. • NEW YORK, N.Y. • PITTSBURGH, PENNA. • PHILADELPHIA, PENNA. • PUEBLO, COLORADO • READING, PENNA • ST. LOUIS, MISSOURI • SAN FRANCISCO, CALIF. • SEATTLE, WASH. • In Canada • MONTREAL, QUEBEC—HAMILTON, ONTARIO

PLANTS • READING, PENNA. • MODENA, PENNA.

IMPORT & EXPORT—LIVINGSTON & SOUTHARD, INC., Chrysler Building East, New York, N.Y. • 5950 S. Boyle Ave., Los Angeles 58, Cal. Cable Address: FORENTRACO

Prospects for 1960 Bright

The outlook for aluminum, copper, and zinc: Shipments and consumption will rise, production will be stepped up, and prices will go up slightly. Labor conditions will improve

Nonferrous Metal Prices, Page 406 & 407

EVERYONE'S optimistic about 1960!

In those four words a metal executive sums up the overwhelming consensus that the coming 12 months will bring more sales, higher production, and a much more stable labor situation for the major nonferrous metal companies.

Here's how 1960 shapes up:

• **More Records for Aluminum**—Previous sales and production records were shattered in 1959. Primary production reached about 1.95 million tons, 25 per cent better than the 1.57 million tons turned out in 1958 and 16 per cent over the previous record of 1.68 million tons set in 1956. This year: Look for primary output somewhere between 2.1 million and 2.2 million tons.

Shipments to consumers in 1959 jumped to around 2.45 million tons; in 1958, 1.79 million tons were shipped. This year: Expect a 10 to 20 per cent increase in shipments.

Supply will continue to exceed demand. Estimates peg total aluminum supply (primary, secondary, and imports) in 1960 at 3.1 million tons against 2.7 million in 1959.

The primary industry has an installed capacity of 2.336 million tons. Facilities under construction will boost that figure to 2.6 million tons by the end of 1961, estimates the Aluminum Association.

Prices went up 1.3 cents a pound for pig last month to 26 cents (corresponding increases are being made for mill products). You may see one or two boosts to bring the price to around 27 cents.

• **Zinc to Gain**—Zinc's two largest customers, galvanizers and automakers, expect to have an excellent year. Provided there are no lengthy strikes in consuming industries, zincmen forecast 1960 shipments of slab zinc from U. S. smelters at around 1 million tons compared with an estimated 882,000 shipped in 1959.

Domestic production of slab zinc will be in the neighborhood of 925,000 to 950,000 tons compared with output of around 850,000 in 1959. U. S. mine production may increase to an average of 45,000 tons a month vs. 35,000 in 1959 and 34,000 in 1958. Zinc imports should rise to 483,000 tons, the maximum of quotas. Producers' stocks may dip about 75,000 tons.

The price of zinc, now 12.5 cents a pound (for prime western), probably will advance 0.5 to 1 cent a pound if business improves as expected.

• **Copper Outlook Good**—Despite a lengthy strike which shut down the bulk of the industry over the greater part of 1959's second half, the industry had its best year saleswise since 1956. Domestic deliveries to fabricators rose to about 1.3 million tons vs. 1,179,416 tons in 1958. U. S. consumption was a little over 1.4 million tons compared with 1,166,000 in 1958. Mine output fell from 980,000 tons to around 825,000. Refined output was down from 1,446,540 tons to about 1,220,000.

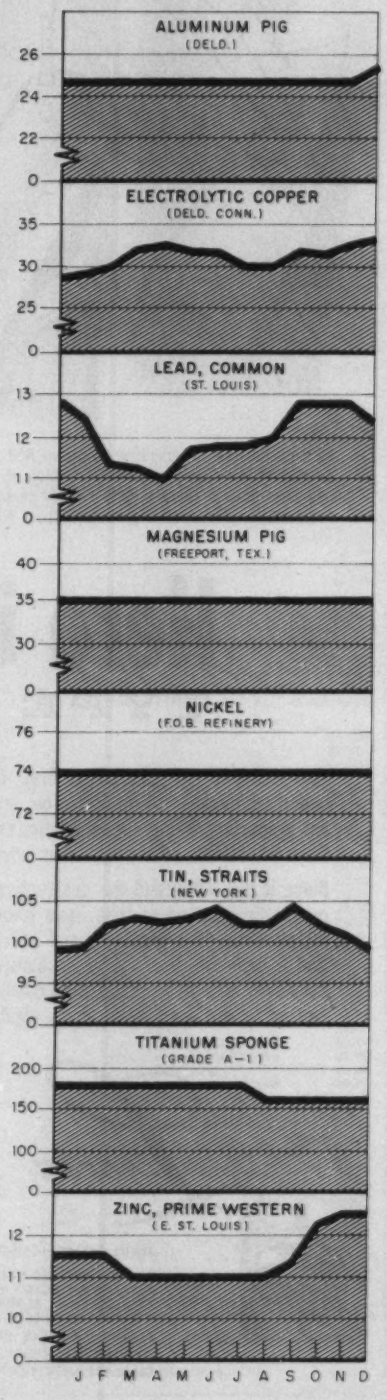
This year provided the strikes end shortly as expected, look for: Mine output of 1,160,000 tons, refined production of at least 1.4 million, and consumption (of refined copper) of 1,550,000.

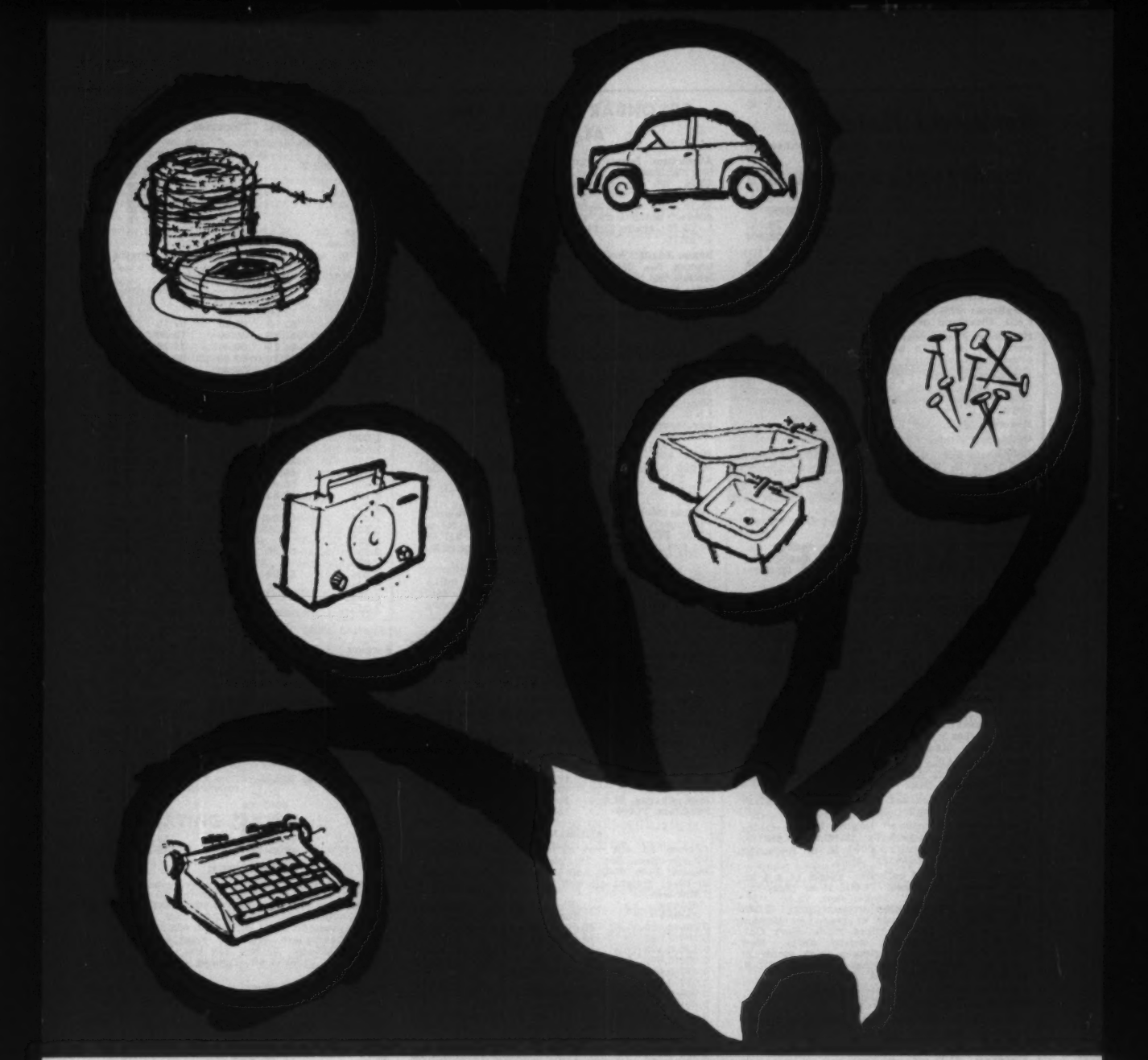
After the strike ends, it will take four to eight weeks for enough shapes to be turned out to give consumers any appreciable relief. Some copper products may be a little tight for four to six months.

Some indication of the price trend was given when a custom smelter announced (on Dec. 23) that it would sell copper for February shipment at 35 cents a pound, 2 cents above the primary quotation. Prices may advance in the early part of this year. But later, when oversupply begins to assert itself again, you can expect quotations to dip.

How Prices Went in '59

(Cents per pound)





SIX DIFFERENT WAYS TO LOSE A JOB

The man in the picture at left could be your neighbor . . . or could be you. Shown above him are a few of the many imported articles he and other Americans have been buying at prices substantially lower than those of domestic products in steadily rising quantities. Each sale of an imported item means a lost sale to a domestic producer: each lost sale inevitably must be reflected in lower production by domestic producers which in turn must mean fewer jobs for American workers.

The problem of imports is one the ferro-alloys industry has had to face for several years, and the reason for our concern, while based naturally enough on our lost sales, is that this trend must ultimately have a serious effect on the jobs of every American. Further, this trend could all too easily affect the strength of American industry on which our entire economy is based.

Perhaps the import problem has not yet made itself felt in your industry. It will.

QUALITY DEPENDABILITY SERVICE

Ohio Ferro-Alloys Corporation
Canton, Ohio

Birmingham, Boston, Chicago, Denver, Detroit, Houston, Kansas City, Los Angeles, Minneapolis, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Seattle, Vancouver, B.C.

Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99.5%, pigs, 26.00; ingots, 28.10, 30,000 lb or more, f.o.b. customer custody.

Aluminum Alloy: No. 13, 29.90; No. 43, 29.70; No. 195, 30.70; No. 214, 31.50; No. 356, 28.60; 30 or 40 lb ingots.

Antimony: R.M.M. brand, 99.5%, 29.00; Lone Star brand, 29.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 24.50-25.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97% lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.75% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb, ton lots.

Cadmium: Sticks and bars, $1.40 per lb deld.

Cobalt: 99+%, $1.75 per lb for 500-lb keg, $1.77 per lb for 100 lb case; $1.82 per lb under 100 lb.

Columbium: Powder, $55-85 per lb nom.

Copper: Electrolytic, 33.00 deld.; custom smelters, 35.00; lake, 33.00 deld.; fire refined, 32.75 deld.

Germanium: First reduction, less than 1 kg, 38.30 per gram; 1-10 kg, 33.30 per gram; 10 kg or more, 31.30 per gram; intrinsic grade, 33.30-35.30 per gram.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $75-80 per troy oz nom.

Lead: Common, 11.80; chemical, 11.90; corroding, 11.90, St. Louis. New York basis, add 0.20.

Lithium: 1 lb or 2 lb ingots, less than 50 lb, $11 per lb, f.o.b. Minneapolis; 50-99 lb, $10; 100-499 lb, $9.50; 500 lb or more, $9 per lb, delivered.

Magnesium: Pig, 35.25; ingot, 36.00 f.o.b. Velasco, Tex.; 1.3 in. diam. x 12 in. sticks, 57.00 f.o.b. Madison, Ill.

Magnesium Alloy: AZ91A (diecasting), 40.75; AZ63A, AZ92A, AZ91C (sand casting), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $212-214 per 75 lb flask.

Molybdenum: Unalloyed forging billets, 4.125-7.0 in. diam., 50-4999 lb, $8.15-11.50 per lb, depending on quantity; 5000 lb or more, $8 per lb, f.o.b. Coldwater, Mich.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "XX" nickel shot, 79.50; "F" nickel shot for addition to cast iron, 74.50; "F" nickel, 5 lb ingots in kegs for addition to cast iron, 75.50. Prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01. Nickel oxide sinter at Buffalo, New York, or other established U. S. ports of entry, contained nickel, 69.60.

Osmium: $70-100 per troy oz nom.

Palladium: $22-24 per troy oz.

Platinum: $77-80 per troy oz from refineries.

Radium: $18-21.50 per mg radium content, depending on quantity.

Rhodium: $122-125 per troy oz.

Ruthenium: $55-60 per troy oz.

Selenium: $7.00 per lb, commercial grade.

Silver: Open market, 91.375 per troy oz.

Sodium: Solid pack, c.l., 19.50; l.c.l., 20.00; brick, c.l., 21.00; l.c.l., 21.50; tank car, 17.00.

Tantalum: Melting stock, $35 per lb; rod, $60 per lb nom.; sheet, $55 per lb nom.

Tellurium: $2.50 per lb.

Thallium: $7.50 per lb.

Tin: Straits, N. Y., spot and prompt, 98.625.

Titanium: Sponge, 99.3+% grade A-1, ductile (0.3% Fe max.), $1.60 per lb; grade A-2 (0.5% Fe max.), $1.50 per lb.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $2.75-2.90 per lb nom., f.o.b. shipping point; less than 1000 lb, add 15.00; 99+% hydrogen reduced, $3.10-4.00.

Zinc: Prime western, 12.50; brass special, 12.75; intermediate, 13.00, East St. Louis, freight allowed over 0.50 per lb. New York basis, add 0.50. High grade, 13.75; special high grade, 14.00 deld. Diecasting alloy ingot No. 3, 15.75; No. 2, 16.25; No. 5, 16.00 deld.

Zirconium: Reactor grade sponge, 100 lb or less, $8 per lb; 100-500 lb, $7.00 per lb; over 500 lb, $6.50 per lb.
(Note: Chromium, manganese, and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 27.25-29.00; No. 12 foundry alloy (No. 2 grade), 25.00-25.25; 5% silicon alloy, 0.60 Cu max., 26.25; 13 alloy, 0.60 Cu max., 26.25; 195 alloy, 28.00-28.75; 108 alloy, 25.50-25.75. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 25.75; grade 2, 24.50; grade 3, 23.50; grade 4, 22.75.

Brass Ingot: Red brass, No. 115, 30.75; tin bronze, No. 225, 41.50; No. 245, 36.00; high-leaded tin bronze, No. 305, 35.25; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 29.25.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.25; AZ91C, 41.25; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nom. 1.9% Be alloy.) Strip, $1.975, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.955, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 20,000-lb lots, 38.35; l.c.l., 38.98. Weatherproof, 20,000-lb lot, 38.55; l.c.l., 39.30.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh.) Sheets, full rolls, 140 sq ft or more, $17.50 per cwt; pipe, full coils, $17.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill.) Sheet and strip, $7.25-17.00; sheared mill plate, $5.25-10.00; wire, $5.55-9.50; forging billets, $3.20-4.75; hot-rolled and forged bars, $4.00-6.25.

ZINC

(Prices per lb, c.l., f.o.b. mill.) Sheets, 26.00; ribbon zinc in coils, 21.50; plates, 20.00.

ZIRCONIUM

Plate, $12.50-19.20; H.R. strip, $12.50-22.90; C.R. strip, $15.90-31.25; forged or H.R. bars, $11.00-17.40.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	138	120	138
Strip, C.R.	124	108	138
Plate, H.R.	130	110	126
Rod, Shapes, H.R.	107	89	109
Seamless Tubes	157	129	200

ALUMINUM

(Prices do not yet reflect latest increases. Please check Jan. 11, 1960 issue.)
Sheets: 1100, 3003, and 5005 mill finish (30,000 lb base; freight allowed).

Thickness Range Inches	Flat Sheet	Coiled Sheet
0.250-0.136	42.80-47.30	.....
0.136-0.096	43.20-48.30	.....
0.126-0.103	.....	39.20-39.80
0.096-0.077	43.80-50.00	39.30-40.00
0.077-0.068	44.30-52.20	.....
0.077-0.061	.....	39.50-40.70
0.068-0.061	44.30-52.20	.....
0.061-0.048	44.90-54.40	40.10-41.80
0.048-0.038	45.40-57.10	40.60-43.20
0.038-0.030	45.70-62.00	41.00-45.70
0.030-0.024	46.20-53.70	41.30-45.70
0.024-0.019	46.90-56.80	42.40-44.10
0.019-0.017	47.70-54.10	43.00-44.70
0.017-0.015	48.60-55.00	43.80-45.50
0.015-0.014	46.60	48.80-46.50
0.014-0.012	50.80	45.50
0.012-0.011	51.00	46.70
0.011-0.0095	53.50	48.10
0.0095-0.0085	54.60	49.60
0.0085-0.0075	56.20	50.85
0.0075-0.007	57.70	52.30
0.007-0.006	59.30	53.70

ALUMINUM (continued)

Plates and Circles: Thickness 0.250-3 in. 24-60 in. width or diam., 72-240 in. lengths

Alloy	Plate Base	Circle Base
1100-F, 3003-F	42.40	47.20
5050-F	43.50	48.30
3004-F	44.50	50.20
5052-F	45.10	50.90
6061-T6	45.60	51.70
2024-T4	49.30	56.10
7075-T6*	57.60	64.70

*24-48 in. width or diam., 72-180 in. lengths

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats*	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
0.125	76.90	73.90	....	....
0.250	62.00	60.20	89.10	76.60
0.375	61.20	60.00	73.50	68.50
0.500	61.20	60.00	73.50	68.50
0.625	61.20	60.00	69.80	64.20
0.750	59.70	58.40	63.60	60.40
0.875	59.70	58.40	63.60	60.40
1.000	59.70	58.40	63.60	60.40
1.125	57.30	56.10	61.50	58.30
1.250	57.30	56.10	61.50	58.30
1.500	57.30	56.10	61.50	58.30
1.500	57.30	56.10	61.50	58.30
1.625	55.00	53.60	....	56.20
1.750	55.00	53.60	60.30	56.20
1.875	55.00	53.60	....	56.20
2.000	55.00	53.60	60.30	56.20
2.125	53.50	52.10	....	....
2.250	53.50	52.10	....	56.20
2.375	53.50	52.10	....	....
2.500	53.50	52.10	....	56.20
2.625	....	50.40	....	....
2.750	51.90	50.40	....	56.20
2.875	....	50.40	....	....
3.000	51.90	50.40	....	56.20
3.125	....	50.40	....	....
3.250	....	50.40	....	....
3.375	....	50.40	....	....

*Selected sizes.

Forging Stock: Round, Class 1, random length diam., 0.375-8 in., "F" temper; 2014, 42.20-55.00; 6061, 41.60-55.00; 7075, 61.60-75.00; 7070, 66.60-80.00.

Pipe: ASA schedule 40, alloy 6063-T6 standard length, plain ends, 90,000 lb base, dollars per 100 ft. Nominal pipe sizes: ⅜ in., 18.85; 1 in., 29.75; 1¼ in., 40.30; 1½ in., 48.15; 2 in., 58.30; 4 in., 160.20; 6 in., 287.55; 8 in., 432.70.

Extruded Solid Shapes:

Factor	Alloy 6063-T5	Alloy 6062-T6
9-11	42.70-44.20	51.30-55.50
12-14	42.70-44.20	52.00-56.50
15-17	42.70-44.20	53.20-58.20
18-20	43.20-44.70	55.20-60.80

MAGNESIUM

Sheets and Plate: AZ31B standard grade, .032 in., 103.10; .081 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.00 in., 67.90. AZ31B spec grades, .032 in., 171.30; .081 in., 108.80; .125 in., 98.10; .188 in., 95.70; .250-2.00 in., 93.30. Tread plate, 60-192 in. lengths, 24-72 in widths; .125 in., 74.90; .188 in., 71.70-72.10; .25-.75 in., 70.60-71.60. Tooling plate, 0.25-3.0 in., 73.00.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grade (AZ31B)
6-8	85.30-87.60	84.60-87.40
12-14	85.30-87.60	85.70-88.00
24-26	86.10-88.40	90.60-91.30
36-38	71.50-75.30	104.20-105.30

NONFERROUS SCRAP

DEALERS' BUYING PRICES

Copper and Brass: No. 1 heavy copper and wire, 24.75-25.25; No. 2 heavy copper and wire, 21.75-22.25; light copper, 20.25-20.75; No. 1 composition red brass, 18.50-18.75; No. 1 com-

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES e (Based on copper at 33.00c)		
	Sheets, Strip, Plate	Rod	Wire	Seamless Tubes	Clean Heavy	Rod Ends	Clean Turnings
Copper	57.13b	54.86c	....	58.32	29.000	29.000	28.250
Yellow Brass	50.57	36.06d	50.86	54.23	22.250	21.250	20.250
Low Brass, 80%	53.53	53.22	53.82	57.09	24.750	24.500	24.000
Red Brass, 85%	54.58	54.27	54.87	58.14	25.750	25.500	25.000
Com. Bronze, 90%	56.17	55.86	56.46	59.48	26.750	26.500	26.000
Manganese Bronze	58.86	52.21	62.69	....	20.875	20.625	19.875
Muntz Metal	53.20	48.26	....	....	20.875	20.625	20.125
Naval Brass	55.12	48.68	61.43	58.78	20.750	20.500	20.000
Silicon Bronze	62.86	61.80	62.15	80.79	28.375	28.125	27.375
Nickel Silver, 10%	65.98	68.06	68.06	....	26.875	26.625	14.937
Phos. Bronze	77.44	78.19	77.69	79.37	29.875	29.625	28.625

a. Cents per lb, f.o.b. mill; freight allowed on 50 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb.

position turnings, 17.25-17.75; new brass clippings, 16.00-16.50; light brass, 12.25-12.50; heavy yellow brass, 13.25-13.75; new brass rod ends, 14.00-14.50; auto radiators, unsweated, 14.50-15.00; cocks and faucets, 15.50-16.00; brass pipe, 15.75-16.20.

Lead: Soft scrap lead, 8.00-8.50; battery plates, 3.50-3.75; linotype and stereotype, 9.00-9.50; electrotype, 7.25-7.75; mixed babbitt, 9.50-10.00.

Monel: Clippings, 29.00-31.00; old sheets, 25.00-27.00; turnings, 20.00-22.00; rods, 29.00-31.00.

Nickel: Sheets and clips, 52.00-54.00; rolled anodes, 52.00-54.00; turnings, 39.00-40.00; rod ends, 52.00-54.00.

Zinc: Old zinc, 4.25-4.75; new diecast scrap, 4.00-4.25; old diecast scrap, 2.50-2.75.

Aluminum: Old castings and sheets, 11.00-11.50; clean borings and turnings, 7.00-7.50; segregated low copper clips, 15.00-15.50; segregated high copper clips, 14.00-14.50; mixed low copper clips, 14.50-15.00; mixed high copper clips, 12.50-13.00.

(Cents per pound, Chicago)

Aluminum: Old castings and sheets, 12.75-13.25; clean borings and turnings, 10.00-10.50; segregated low copper clips, 16.75-17.25; segregated high copper clips, 16.00-16.50; mixed low copper clips, 16.00-16.50; mixed high copper clips, 15.50-16.00.

(Cents per pound, Cleveland)

Aluminum: Old castings and sheets, 11.50-11.75; clean borings and turnings, 10.50-11.00; segregated low copper clips, 15.75-16.25; segregated high copper clips, 14.75-15.25; mixed low copper clips, 15.25-15.75; mixed high copper clips, 14.25-14.75.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 59.00; light scrap, 54.00; turnings and borings, 39.00.

Copper and Brass: No. 1 heavy copper and wire, nom.; No. 2 heavy copper and wire, 26.50; light copper, 23.00; refinery brass (60% copper) dry copper content, 24.25.

INGOTMAKERS' BUYING PRICES

Copper and Brass: No. 1 heavy copper and wire, nom.; No. 2 heavy copper and wire, 25.50; light copper, 23.00; No. 1 composition borings, 22.50; No. 1 composition solids, 23.00; heavy yellow brass solids, 17.00; yellow brass turnings, 16.00; radiators, 17.50.

PLATING MATERIAL

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.40.

Copper: Flat-rolled, 50.04; oval, 48.00; 5000-10,000 lb; electrodeposited, 42.50, 2000-5000 lb lots; cast, 45.00, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, 114.25; 100-499 lb, 112.00; 500-4999 lb, 107.50; 5000-29,999 lb, 105.25; 30,000 lb, 103.00. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab, less than 200 lb, 117.50; 200-499 lb, 116.00; 500-999 lb, 115.50; 1000 lb or more, 115.00.

Zinc: Balls, 19.75; flat tops, 19.75; flats, 22.50; ovals, 21.75, ton lots.

CHEMICALS

Cadmium Oxide: $1.40 per lb in 100-lb drums.

Chromic Acid (flake): 100-2000 lb, 31.00; 2000-10,000 lb, 30.50; 10,000-20,000 lb, 30.00; 20,000 lb or more, 29.50.

Copper Cyanide: 100-200 lb, 65.90; 300-900 lb, 63.00; 1000-19,900 lb, 61.90.

Copper Sulphate: 100-1900 lb, 16.00; 2000-5900 lb, 14.00; 6000-11,900 lb, 13.75; 12,000-22,900 lb, 13.50; 23,000 lb or more, 13.00.

Nickel Chloride: 100 lb, 45.00; 200 lb, 43.00; 300 lb, 42.00; 400-4900 lb, 40.00; 5000-9900 lb, 38.00; 10,000 lb or more, 37.00.

Nickel Sulphate: 5000-22,999 lb, 29.00; 23,000-39,990 lb, 28.50; 40,000 lb or more, 28.00.

Sodium Cyanide (Cyanobrik): 200 lb, 23.80; 400-800 lb, 20.80; 1000-4900 lb, 19.80; 5000-19,900 lb, 18.80; 20,000 lb or more, 17.60.

Sodium Stannate: Less than 100 lb, 78.00; 100-600 lb, 68.80; 700-1900 lb, 66.00; 2000-9900 lb, 64.10; 10,000 lb or more, 62.80.

Stannous Chloride (Anhydrous): 25 lb, 153.20; 100 lb, 148.30; 400 lb, 145.90; 800-19,900 lb, 105.00; 20,000 lb or more, 98.90.

Stannous Sulphate: Less than 50 lb, 138.40; 50 lb, 108.40; 100-1900 lb, 106.40; 2000 lb or more, 104.40.

Zinc Cyanide: 100-200 lb, 59.00; 300-900 lb, 57.00.

(*Concluded from Page 401*)

of scrap until the steel labor contract controversy is resolved. The mills are continuing to lean heavily on blast furnace hot metal despite the possibility of running low on iron ore before the 1960 lake navigation season opens. Scrap inventories, however, are ample and receipts of industrial material from preferred sources under contract arrangement are substantial.

• **Buffalo**—Prices are steady. No new mill buying has been reported and little trading is anticipated until the steel labor situation is finally settled. The final boatloads of scrap from Detroit arrived at Buffalo area mills, and with the Detroit area mill scrap now out of the picture, local consumers will be dependent on dealer material for a while.

• **Cincinnati**—Cross currents in the market lend to uncertainty with respect to the immediate future price trend. The trade is looking to the industrial lists at the end of the month to point the way for dealer prices. Some observers think a $2 drop is possible unless the steel labor situation is cleared up. Area mills are expected to come out with their January requirements this week.

• **Birmingham** — Little scrap is moving in this district. However, Central Foundry Co., Holt, Ala., has notified dealers it will make spot buys ranging up to 100 tons. Prices are unchanged but nominal in the absence of active demand.

• **Los Angeles**—District mills are buying limited tonnages for immediate use. No. 1 heavy melting is holding at $40, but the market outlook is uncertain. Japanese buying appears to be coming to a halt. Export commitments for the first quarter were cut 55 per cent from the tonnage moved in the fourth quarter, 1959.

FLORIDA

PRODUCTION SUPERINTENDENT
SHEET METAL FABRICATING
PLATING AND PAINTING

EMR—with over 450 employes and modern air conditioned facilities exceeding 100,000 sq. ft.—has a newly created position immediately available for an experienced engineer to set up and manage a custom sheet metal, electro-plating, and spray painting facility.

Candidate should be between the ages of 30 and 45 with previous related experience in the electronic manufacturing industry.

Send resume to John Truitt, Personnel Manager

ELECTRO-MECHANICAL RESEARCH, INC.
Sarasota, Florida

MANUFACTURING MANAGER
Metal Products

Our company, known for its product quality, seeks an experienced manufacturing executive capable of directing all operations in 3 separate plants which employ 600 people and ship a $30,000,000 volume annually.

The right man must have a working knowledge of sheet metal fabrication and assembly and be experienced in modern machine shop techniques including heat treating, plating and related metal working processes. He will have full line responsibility and report to the Divisional General Manager.

Starting salary is in the $20,000 range, plus bonus, option and other benefits.

You may write us in complete confidence. Please include details of business experience and personal background.

Box 818, STEEL,
Penton Bldg. Cleveland 13, Ohio

QUANTITY PRODUCTION OF GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

CHATTANOOGA 2, TENN.

WARD STEEL CO.

We specialize in FINISHED STEEL BARS—TUBES—STRIP

PROMPT WAREHOUSE SERVICE ONLY

Most Complete Stock in America of BLUE TEMPERED SPRING STEEL

We believe that the way to sell is to carry a stock which permits satisfying any reasonable warehouse demand.

87A Hidden Ave. Ext. Phone UN 4-2460
CAMBRIDGE 40, MASS.

Branch:
3042-3058 W. 51st Street, CHICAGO, ILL.
Phone: Grovehill 6-2600

Advertising Index

Acme-Newport Steel Co. 378
Acro Welder Mfg. Co. 401
Air Reduction Sales Co., A Division of Air Reduction Co., Inc. 301
Ajax Electric Motor Corporation 407
Alan Wood Steel Co. 135
Allegheny Ludlum Steel Corporation 197
Alliance Machine Co., The 235
Allied Chemical Corporation, General Chemical Division 203
Allied Research Products, Inc. 371
Alloy Metal Abrasive Co. 352, 353
Aluminium Limited Sales, Inc. 120
American Air Filter Co., Inc. 21
American Cast Iron Pipe Co., Special Products Division 12
American Pulverizer Co. 385
American Roller Die Corporation 226
American Schiess Corporation 312
American Smelting & Refining Co., Federated Metals Division 225
American Society for Metals 273
American Steel & Wire Division, United States Steel Corporation 8, 9
American Waldrich Mfg. Corporation 313
Apex Machine & Tool Co., The 284
Arcos Corporation 296, 297
Armco Steel Corporation 90
Armco Steel Corporation, Sheffield Division .. 80
Aronson Machine Co. 68
Atlantic Refining Co., The 45
Avondale Marine Ways, Inc., Service Foundry Division 344

Babcock & Wilcox Co., The, Tubular Products Division .....Inside Front Cover
Bailey, William M., Co. 271
Baker, J. E., Co., The 315
Baldwin-Lima-Hamilton Corporation, Hamilton Division 343
Baldwin-Lima-Hamilton Corporation, Loewy-Hydropress Division 33
Bearings, Inc. 279
Benchmaster Manufacturing Co. 16
Bethlehem Steel Co. 1
Binks Manufacturing Co. 199
Bishop, J., & Co. Platinum Works 28
Blaw-Knox Co. 37, 38, 39, 40
Bliss, E. W., Co., Mackintosh-Hemphill Division 29
Borg-Warner Corporation, Ingersoll Steel Division 289
Borg-Warner Industrial Cranes 309
Boston Gear Works 363
Bridgeport Brass Co. 341
Brighton Screw & Manufacturing Co. 212
Brook Motor Corporation 202
Brown-Lipe-Chapin Division of General Motors Corporation 222
Buffalo Forge Co. 34, 410
Bunting Brass & Bronze Co., The 234

Cambridge Wire Cloth Co., The 243
Canton Manufacturing Co. 397
Cement Gun Co. 202
Chicago Rawhide Manufacturing Co., Oil Seal Division 107
Cincinnati Lathe & Tool Co. 26
Cincinnati Milling Machine Co., The 110, 111
Cincinnati Milling Machine Co., The, Meta-Dynamics Division 7
Cincinnati Shaper Co., The 66, 67
Clad-Rex, Division of Simoniz Co. 52
Cleveland Crane & Engineering Co., The, Steelweld Machinery Division 54, 55
Cleveland Instrument Co. 368
Cleveland Punch & Shear Works Co., The .. 290
Colorado Fuel & Iron Corporation, The .42, 43, 63
Columbia-Geneva Steel Division, United States Steel Corporation 8, 9
Columbus McKinnon Chain Corporation 314
Commercial Shearing & Stamping Co. 3
Composite Forgings, Inc. 397
Continental Steel Corporation 318
Copperweld Steel Co., Ohio Seamless Tube Division 330
Copperweld Steel Co., Superior Steel Division 255
Crown Zellerbach Corporation, Gaylord Container Division 57
Crucible Steel Casting Co. 393

Dana Corporation, Parish Pressed Steel Division 30
Decatur Casting Co., The 27
Despatch Oven Co. 319
Detrex Chemical Industries, Inc. 293
Diamond Mfg. Co. 409
Dixie Bearings, Inc. 279
Dodge Manufacturing Corporation 50
Duraloy Co., The 244
Dykem Co., The 397

Elastic Stop Nut Corporation of America 310
Electro-Mechanical Research Inc. 407
Erie Engine & Mfg. Co., International Clay Machinery Division 214
Erie Forge & Steel Corporation 317
Erie Strayer Co. 342
Esso Standard, Division of Humble Oil & Refining Co. 380
Ex-Cell-O Corporation, Machinery Division .. 53

Falk Corporation, The 47
Fate-Root-Heath Co., The, Plymouth Locomotive Works Division 125
Federal Bearings Co., Inc., The 31
Federal Products Corporation 277
Federated Metals Division of American Smelting & Refining Co. 225
Fellows Gear Shaper Co., The 24
Fischer Special Mfg. Co. 285
Frasse, Peter A., & Co., Inc. 211
Fuji Iron & Steel Co., Ltd. 74
Furane Plastics, Inc. 342

Gardner-Denver Co. 58
Garlock Packing Co., The 22
Gaylord Container Division, Crown Zellerbach Corporation 57
Gear Specialties, Inc. 48, 49
General Chemical Division, Allied Chemical Corporation 203
General Electric Co. 81
General Electric Co., Computer Department .. 245
General Motors Corporation, Brown-Lipe-Chapin Division 222
General Motors Corporation, Hyatt Bearings Division 116
General Motors Corporation, New Departure Division 119
General Motors Corporation, Saginaw Steering Gear Division 325
General Refractories Co. 376, 377
General Steel Castings 355
Gerlinger Carrier Co. 77
Gisholt Machine Co. 62
Gleason Works 71
Globe Brick Co., The 366
Goodyear Tire & Rubber Co., Inc., The, Industrial Products Division 4
Gorton, George, Machine Co. 272
Great Lakes Carbon Corporation, Electrode Division 205

Hallden Machine Co., The 193
Hamilton Division, Baldwin-Lima-Hamilton Corporation 343
Hamilton Foundry, Inc. 258
Handy & Harman 303
Harbison-Walker Refractories Co. 194, 195
Harrington & King Perforating Co., Inc., The 360
Harshaw Chemical Co., The 36
Hendrick Mfg. Co. 11
Homestead Valve Manufacturing Co. 13
Hooker Chemical Corporation 327
Horsburgh & Scott Co., The 328
Howe Sound Co., Sperry Products Co. Division 251
Hull, R. O., & Co., Inc. 365
Humble Oil & Refining Co., Esso Standard Division 380
Huntington Alloy Products Division, The International Nickel Co., Inc. 367
Hyatt Bearings Division, General Motors Corporation 116
Hyde Park Foundry & Machine Co. 283

Ingalls Iron Works Co., The 356, 357
Ingersoll-Rand 84
Ingersoll Steel Division, Borg-Warner Corporation 289
International Clay Machinery Division, Erie Engine & Mfg. Co. 214
International Nickel Co., Inc., The, Huntington Alloy Products Division 367

Jones & Laughlin Steel Corporation 220, 221
Jones & Laughlin Steel Corporation, Stainless & Strip Division 25

Kearney & Trecker Corporation 262, 263
Keystone Steel & Wire Co. 83
Kinnear Manufacturing Co., The 219
Kirk & Blum Mfg. Co., The 316

Laclede Steel Co. 349
Landis Machine Co. 14, 15
Landis Tool Co. 115
Lindberg Engineering Co. 240, 241
Lodge & Shipley Co., The 383
Loewy-Hydropress Division, Baldwin-Lima-Hamilton Corporation 33
Logan Co. 132, 133
Loma Machine Mfg. Co., Inc. 348
Luria Brothers & Co., Inc. 403

McGill Manufacturing Co., Inc., Bearing Division 82
McLouth Steel Corporation 61

Mackintosh-Hemphill Division of E. W. Bliss Co. 29
Magnaflux Corporation 246
Malleable Castings Council 72, 73
Marathon Specialty Steels, Inc. 69
Mechanite Metal Corporation 227
Mesta Machine Co. 200, 201
Metal Progress 273
Midland-Ross Corporation, Surface Combustion Division 259
Minneapolis-Honeywell 350
Meltrup Steel Products Co. 393
Mundt, Charles, & Sons 212

New Departure Division, General Motors Corporation 119
Niagara Machine & Tool Works 338, 339

Ohio Crankshaft Co., The 75
Ohio Ferro-Alloys Corporation 405
Ohio Knife Co., The 109
Ohio Seamless Tube Division of Copperweld Steel Co. 330
Ohio Steel Foundry Co., The 126

Pacific Tube Co. 384
Parish Pressed Steel Co. Division of Dana Corporation 30
Parker Rust Proof Co. 129
Peninsular Steel Co. 274
Pennsylvania Engineering Corporation 198
Philadelphia Gear Corporation 186
Pines Engineering Co., Inc. 266
Pittsburgh Steel Co. 78, 79
Plymouth Locomotive Works, Division of The Fate-Root-Heath Co. 125
Porter, H. K., Inc. 393
Pratt & Whitney Co., Inc. 268, 269

Republic Steel Corporation 372, 373
Revere Copper & Brass, Inc. 215
Robbins & Meyers, Inc., Hoist & Crane Division 41
Robinson Clay Product Co., The 397
Rockford Machine Tool Co. 122, 123
Roebling's, John A., Sons Division, The Colorado Fuel & Iron Corporation 63
Rollway Bearing Co. 64
Roto-Finish/Ransohoff 23
Rowe Machinery & Manufacturing Co., Inc. 395
Royal McBee Corporation, Data Processing Division 105
Ryerson, Joseph T., & Son, Inc. 17, 18, 19, 20

Saginaw Steering Gear Division, General Motors Corporation 325
Sandvik Steel, Inc. 65
Sharon Steel Corporation 59
Sheffield Division, Armco Steel Corporation 80
Shenango Furnace Co., The, Centrifugally Cast Products Division 213
Simonds Abrasive Co. 56
Simonds Saw & Steel Co. 32
Simoniz Co., Clad-Rex Division 52
SKF Industries, Inc. 2
Sperry Products Co., A Division of Howe Sound Co. 251
Stamco, Inc. 326
Standard Screw Co. 323
Steel Service Center Institute, Inc. 336
Steelweld Machinery Division, The Cleveland Crane & Engineering Co. 54, 55
Sumitomo Metal Industries, Ltd. 399
Sun Shipbuilding & Dry Dock Co. 256
Superior Steel Division of Copperweld Steel Co. 255
Superior Tube Co. 46
Surface Combustion, A Division of Midland-Ross Corporation 259

Tennessee Coal & Iron Division, United States Steel Corporation 8, 9
Textile Machine Works, Contract Division 44
Thomas Flexible Coupling Co. 304
Thomas Machine Manufacturing Co. 130
Thomson, Judson L., Mfg. Co. 265
Timken Roller Bearing Co., The 320
Timken Roller Bearing Co., The, Steel & Tube Division 136
Tomkins-Johnson Co., The 10
Torrington Co., The 89
Torrington Manufacturing Co., The 374, 375
Towmotor Corporation 77

Udylite Corporation, The 252, 295
Union Wire Rope Corporation 70
United Engineering & Foundry Co. 185
United States Steel Corporation, Subsidiaries 8, 9
United States Steel Export Co. 8, 9
Urick Foundry Co. 204

Valley Mould & Iron Corporation 92
Vanadium Corporation of America 35
Van Huffel Tube Corporation 51
Vaughn Machinery Co., The 359
Virginia Gear & Machine Corporation 186

Wales Strippit, Inc. 333
Walsh Refractories Corporation 6
Wapakoneta Machine Co., The 305
Ward Steel Co. 408
Washington Steel Corporation 364
Waterbury Farrel Foundry & Machine Co., The 76
Wean Engineering Co., Inc., The ..... Back Cover
Webb Corporation, The 369
Wheelock, Lovejoy & Co., Inc. 250
Wheland Co., The 408
Whirl-Air-Flow 329
Whitehead Metals, Inc. 335
Wilson, Lee, Engineering Co., Inc. ..... Inside Back Cover
Wrought Washer Mfg. Co. 113
Wyckoff Steel Co. 370

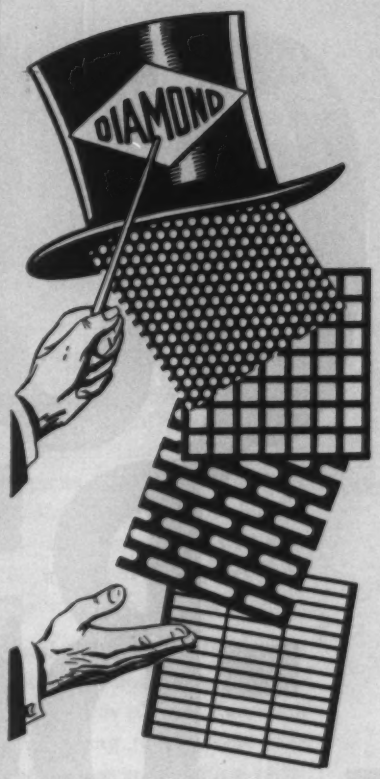
Yoder Co., The 60

~ ~ ~

Table of Contents

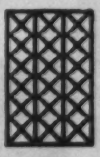
Facing Inside Front Cover

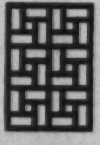
Classified Advertising, Page 407



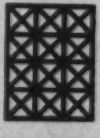
Top-Hat Quality IN Perforated Metal

The popular Diamond Perforated-metal patterns shown above are only a few of the many illustrated and described in our 32-page Catalog No. 39. All of these standard patterns are available in a wide range of unit-opening sizes and we are always equally pleased to quote on original designs of any type or size.

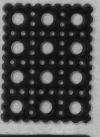




Catalog 39 also illustrates and describes our high-quality lines of *Ornamental Cane*, Perforated-Metal Sheets for Accoustical installations and Heavy-Duty Architectural Grilles. Write, today, for a free copy.

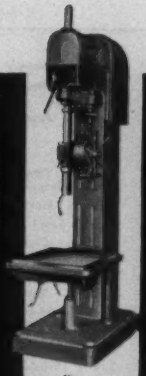


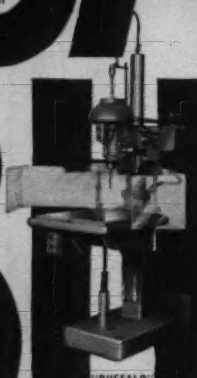
Correspondence is especially invited regarding ANY requirement for perforated-metal panels or parts. We are equipped to fabricate special sections to any desired extent and welcome opportunities to make money-saving suggestions.

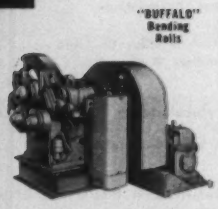


DIAMOND MFG. CO.
WYOMING WILKES-BARRE AREA PA.

QUALITY-BUILT







"BUFFALO" MACHINE TOOLS

COST YOU LESS IN THE LONG RUN

Only Buffalo gives you the "Q" factor . . . an important extra in the quality of our design and construction. This means greater economy for you . . . extended trouble-free productive service.

Now, in a broader line of new and improved models, BUFFALO machine tools are an even better value. That's why you will find these units especially worth investigating.

Buffalo No. 15 Drills — New design improvements provide easier, faster operation, maximum flexibility and even greater accuracy. Available in bench, floor and pedestal models from 1 to 6 spindles. Write for Bulletin 4024.

Buffalo No. 18 Drills — Heavier than No. 15 yet highly sensitive, the No. 18 is ideal for a wide variety of shop operations. Capacity is 1" in cast iron. Features include precision ball bearing spindle, easy-to-operate 3-spoke feed and quick, convenient adjustments. Choose from 19 models to suit your exact needs. Write for Bulletin 3123-E.

Buffalo R-P-Mster — These famous variable speed drilling machines now offer capacities up to 2". Exclusive Torque-Controlled Power Feed protects bits and machine. Operator can use maximum speed and feed for a given hole size with no danger of overloading. Designed for ultra-smooth, accurate operation. Write for Bulletin 3257-C.

Buffalo Bending Rolls — Ideal for fast, low-cost bending of structurals into circles, spirals or segments. Easy roll changes and adjustments eliminate need for expensive dies. Operators need not be highly skilled. Upper roll is quickly lowered, set or released hydraulically. Horizontal or vertical types in a capacity range to suit almost every need. Write for Bulletin 352-D.

For full details on these and all Buffalo machine tools, contact your Buffalo machine tool dealer . . . or write us direct.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

BUFFALO FORGE COMPANY
158 MORTIMER ST. · BUFFALO, NEW YORK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING
PUNCHING
SHEARING
BENDING

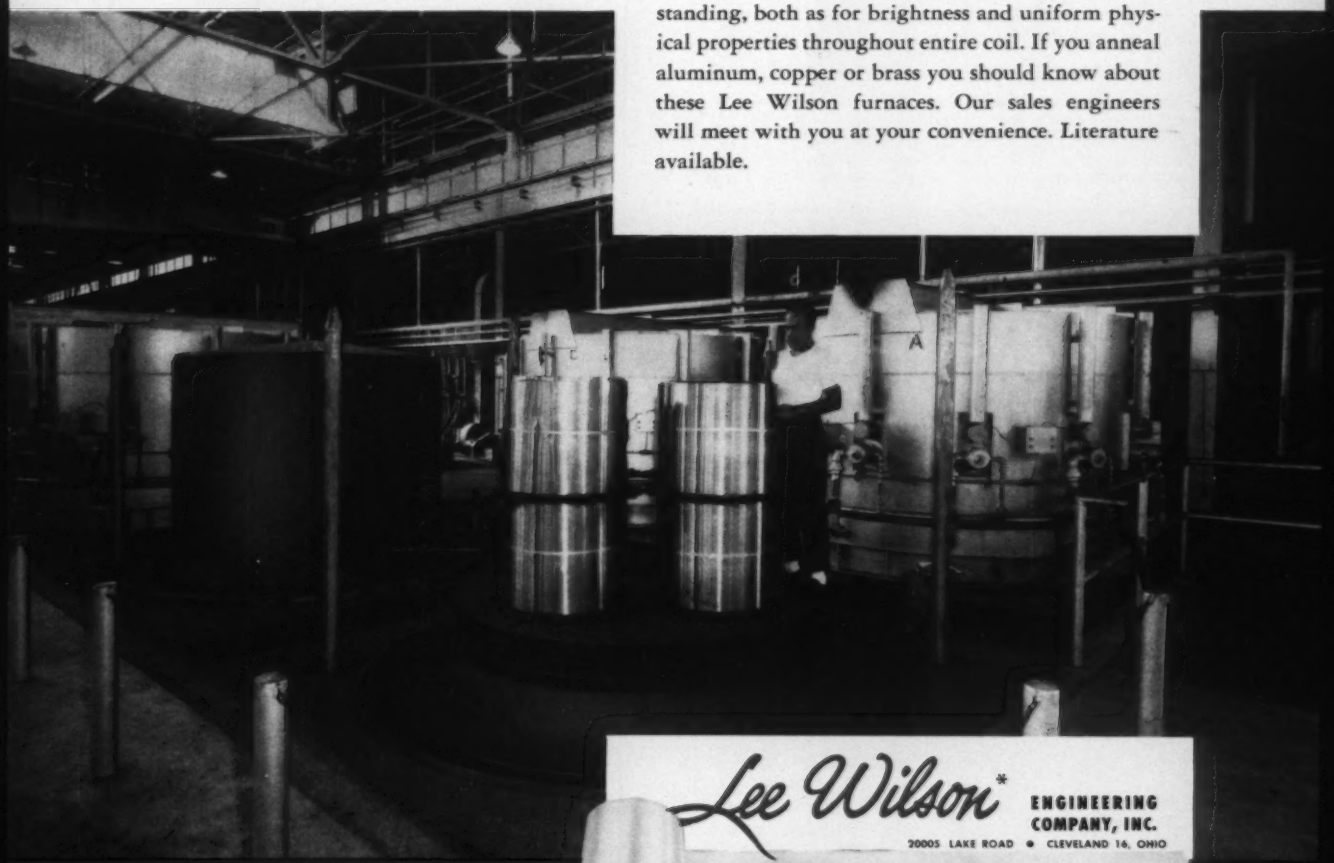
Coils show no edge damage even when stacked three high.

An up-to-the-minute report on the

Bright Annealing of thin gauge Aluminum Coils

Engineers at the Scovill Manufacturing Company, Waterbury, Conn., have definitely proved that thin gauge aluminum coils can be bright annealed while standing on edge without edge damage. This means that aluminum producers and converters now have greater control of annealing and greater production flexibility than ever before, because they will now be able to utilize the high-convection, bell-type furnace designed and perfected by Lee Wilson.

Scovill engineers successfully annealed large coils of .025 gauge under standard annealing practice. Lighter gauges were annealed by placing aluminum discs between coils. Annealing results were outstanding, both as for brightness and uniform physical properties throughout entire coil. If you anneal aluminum, copper or brass you should know about these Lee Wilson furnaces. Our sales engineers will meet with you at your convenience. Literature available.



Three Lee Wilson high-convection furnaces designed to anneal 3,500 pounds of aluminum coils per hour for each furnace.

Lee Wilson* ENGINEERING COMPANY, INC.

20005 LAKE ROAD • CLEVELAND 16, OHIO

HIGH PRODUCTION ANNEALING SYSTEMS

MAKE THE BEST METALS BETTER

* ORIGINATORS AND LEADING PRODUCERS OF OPENED COIL AND SINGLE STACK FURNACES

No. 5 Electrolytic Tinning Line, Gary Sheet and Tin Mill, U. S. Steel Corporation

Wean, U. S. Steel and Tinning...

Twenty-two years ago the world's first commercial production electrolytic tinning line went into operation. Using the "Ferrostan" process, which was developed by U. S. Steel, the line was engineered by Wean and technical personnel of U. S. Steel.

The years of experience and constant progress since that initial installation are incorporated in this "Ferrostan" line. It features the most modern advances in automated tinning line design: cleaning and plating tanks are elevated to reduce basement complexity and simplify maintenance; both recoiling and shearing equipment are provided to satisfy all customer requirements; and an electronic data-logging system provides a "process profile" of all coiled tin plate.

Wean is justly proud of its many years of leadership in tinning line technology: 75% of all electrolytic tin plate produced is the result of Wean's *creative engineering.*

THE WEAN ENGINEERING COMPANY, INC. · WARREN · OHIO

Productioneered Equipment Improves Pickle Line Output

Seven new features developed by Production Machinery engineers and designers are incorporated in this PM Stainless Steel Intermediate Pickling and Annealing Line now in service at Universal Cyclops' Coshocton mill. These developments fit the specific requirement of Universal Cyclops, and result in more profitable operation. Creativity in designing and building equipment to fit the user's needs is the secret of PM "productioneering." We'll be glad to discuss with you the advantages you can get from "productioneered" lines — advantages which generally come as better production, more profits.

Production Machinery Corporation

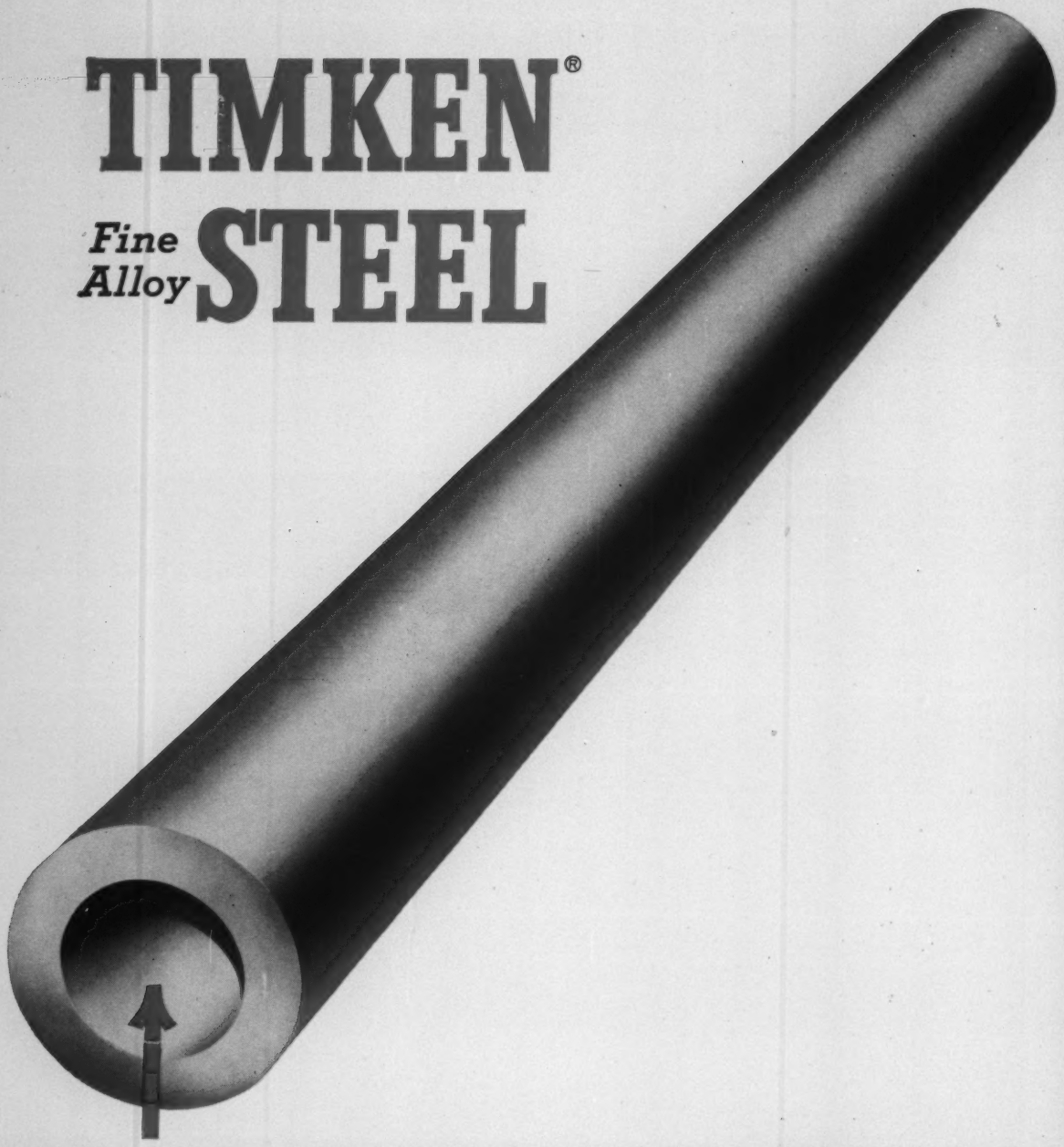
Mentor, Ohio

Designers and Builders of Metal Processing Lines and Equipment including: lines for pickling, slitting, shearing and cutting-to-length, grinding, scouring, coil build-up, inspection, and other sheet and strip processing lines and machinery.

PM®

TIMKEN®

Fine Alloy STEEL



Ready-made savings for your hollow parts

Why bore out bar stock to make your hollow parts? Start with Timken® seamless steel tubing; the hole's already there. You save drilling costs, steel, machining time and you're sure of uniform quality finished parts, too. That's because we make Timken steel tubing by forging a solid round over a mandrel, thoroughly working the metal inside and out. This gives the tubing its fine forged quality and uniform spiral grain flow.

When you buy Timken steel you always get: 1) *Quality* that's uniform from heat to heat, tube to tube, order to order; 2) *Service* from the experts in specialty steels; 3) Over 40 years of *experience* in solving tough steel problems. Let our engineers help you save by recommending the most economical tube size for your hollow parts job . . . one guaranteed to clean up to your finish dimensions. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

TIMKEN ALLOY STEEL AND SEAMLESS STEEL TUBING ARE AVAILABLE FROM WAREHOUSE STOCKS IN 44 CITIES IN THE UNITED STATES